

VIVEKANANDHA
COLLEGE OF ARTS AND SCIENCES FOR WOMEN
[AUTONOMOUS]

SPONSORED BY: ANGAMMAL EDUCATIONAL TRUST.

An ISO 9001: 2015 Certified Institution

Affiliated to Periyar University, Approved by AICTE and

Re-Accredited with 'A+' Grade by NAAC

Recognized under section 2(f) and 12(B) of UGC Act, 1956

Elayampalayam – 637 205.Tiruchengode,Namakkal Dt., TamilNadu



DEPARTMENT OF MATHEMATICS

B.Sc., Mathematics

SYLLABUS & REGULATIONS

FOR THE STUDENTS ADMITTED FROM
2023- 2024 ONWARDS

ACADEMIC YEAR: 2024-2025

VIVEKANANDHA EDUCATIONAL INSTITUTIONS

Angammal Educational Trust

Elayampalayam,Trichengode(T.k),Namakkal(Dt)

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VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN

[Autonomous]

ELAYAMPALAYAM, TIRUCHENGODE

B.Sc. MATHEMATICS - REGULATIONS

(Students admitted from 2023-2024 Onwards)

Under TANSICHE Syllabus

1. SCOPE OF THE PROGRAMME

B.Sc. (Mathematics) is a high profile undergraduate program aimed to create enhanced competence of career positioning tied up with opportunity to become a skilled Mathematician. The program expects a serious commitment of the student to take up challenging study schedules and assignments. The course involves a blend of theoretical education and practical training which run concurrently for a period of three years and equips a student with knowledge, ability, skills and other qualities required for a professional Mathematician.

The uniqueness of the program is its content and topic coverage, the teaching methodology and the faculty. The syllabus has been designed at a level equal to that of professional courses. The teaching methodologies include classroom lectures, industrial visits, orientation, internship, case study and research work. Focus is also on developing soft skills of the students. For Core subjects, Outsource Guest Lectures by Industrialists and Subject Experts will be arranged to enable the students to get wider exposure.

2. SALIENT FEATURES

- ✓ Course is specially designed for a higher level Career Placement.
- ✓ Special Guest lecturers from Subject Experts will be arranged.
- ✓ Special Teaching Oriented Training is part of the Degree Course.
- ✓ Course pave the way for enhanced conceptual, analytical & Deductive skills to meet the Competitive exams like Banking / TNPSC / IAS /IFS etc.,

3. OBJECTIVES OF THE COURSE

Mathematics is a key to success in the field of science and engineering. Today, the students need a thorough knowledge of fundamental basic principles, methods, results and a clear perception of the power of mathematical ideas and tools to use them effectively in modeling, interpreting and solving the real world problems. Mathematics plays an important role in the context of globalization of Indian economy, modern technology, and computer science and information technology. This syllabus is aimed at preparing the students to hope with the latest developments and compete with students from other universities and put them on the right track.

4. ELIGIBILITY FOR ADMISSION

Candidates seeking admission to the first year B.Sc – Mathematics, shall be required to have passed the Higher Secondary Examinations conducted by the Government of Tamilnadu with Mathematics ,Physics and Chemistry subjects.

5. DURATION OF THE COURSE

- The course shall extend over a period of three academic years consisting of six semesters. Each academic year will be divided into two semesters. The first semester will consist of the period from July to November and the Second semester from December to March.
- The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Vivekananda College of Arts And Sciences for Women with the approval of Periyar University.

6. CONTINUOUS INTERNAL ASSESMENT

The performance of the students will be assessed continuously and the Internal Assessment Marks will be as under:

1. Average of two Tests - 5 Marks
 2. Model - 10 Marks
 2. Assignment - 5 Marks
 3. Attendance - 5 Marks
- Total = 25 Marks**

DISTRIBUTION OF MARKS FOR ATTENDANCE

Attendance %	Marks
75-80	1
81-85	2
86-90	3
91-95	4
96-100	5

PASSING MINIMUM EXTERNAL

In the End of Semester, the passing minimum shall be 30 Marks out of 75marks& 40 marks of both Internal and External.

7. ELIGIBILITY FOR EXAMINATION

A candidate will be permitted to appear for the University Examination only on earning 75 % of attendance and on satisfactory. Conduct shall be open to grant exemption to a candidate for valid reasons subject to conditions prescribed with supporting evidence.

8. CLASSIFICATION OF SUCCESSFUL CANDIDATE

Successful candidates passing the examination of Core Courses (main and allied subjects) and securing marks

- a) 75 % and above shall be declared to have passed the examination in first class with Distinction provided they pass all the examinations prescribed for the course at first appearance itself.
- b) 60% and above but below 75 % shall be declared to have passed the examinations in first class.
- c) 50% and above but below 60% shall be declared to have passed the examinations in second class.
- d) All the remaining successful candidates shall be declared to have passed the examinations in third class.
- e) Candidates who pass all the examinations prescribed for the course at the first appearance itself and within a period of three consecutive academic years from the year of admission only will be eligible for rank.

9. ELIGIBILITY FOR AWARD OF THE DEGREE

A candidate shall be eligible for the award of the degree only if she has undergone the above degree for a period of not less than three academic years comprising of six semesters and passed the examinations prescribed and fulfilled such conditions have been prescribed time to time.

10. PROCEDURE IN THE EVENT OF FAILURE

If a candidate fails in a particular subject, she may reappear in the concerned subject in subsequent semesters and shall pass the examination.

11. COMMENCEMENT OF THESE REGULATIONS

These regulations shall take effect from the academic year 2018-19 (i.e.) for the students who are to be admitted to the first year of the course during the academic year 2018-19 and thereafter.

12. TRANSITORY PROVISIONS

Candidates who have undergone the PG programme of study before 2018-19 shall be permitted to appear for the examinations under those regulations of the year in which the candidates admitted to the programme. Supplementary examination will be conducted within a month. In case of failure she has to complete within 5 years (2+3).

Thereafter, they will be permitted to appear for the examination only under the regulation then in force.

For the deserving candidates, if a student fails in a single subject she can be provided with maximum 5 marks as grace mark subject to the recommendation of the passing board.

ABOUT THE COLLEGE

Vivekanandha College of Arts and Sciences for Women (Autonomous) was established and hailed into Women's Educational Service in the Year 1995. Angammal Educational Trust Chaired by the great Educationalist 'VidhyaRathna' Prof.Dr. M. KARUNANITHI, B.Pharm., M.S., Ph.D., D.Litt., sponsors this college and other institutions under the name of the great Saint Vivekanandha. Our institutions are situated on either side of TiruchengodeNamakkal Main Road at Elayampalayam, 6 kms away from Tiruchengode. This is biggest women's college in India with more than 7500 girl students and more than 18 departments. The strength of the college was just 65 at the time of its establishment. With the dedication, work, sacrifice and long vision of the chairman, this institution has grown into a Himalaya stage. As a result of which UGC, New Delhi, awarded 2f and 12b, extended Autonomous status for second cycle. The National Assessment and Accreditation Council reaccredited with grade 'A' for its successful performance.

As an Autonomous Institution, academic professionals of the college framed Curriculum and Syllabi in consultation with all its stakeholders to cater the needs of the young women to fulfil the women empowerment and present Industrial needs to the local benefits. The students are empowering with confidence and required skills to face the society.

OUR VISION

- To evolve into a center of excellence in higher education through creative and innovative practices to social equity for women.

OUR MISSION

- To provide sufficient learning infrastructure to the students to pursue their studies.
- To provide good opportunity for higher education and conducive environment to the students to acquire education.
- To provide quality academic programs training activities and research facilities.
- To facilitate industry-institute interaction.

DEPARTMENT OF MATHEMATICS

VISION

- Empowerment of women through Education.
- To upgrade performance standards in the field of Mathematics in order to be a leading department in academic arena.
- To provide excellence in education for all students. We will assess and design courses and learning experiences that promote the academic achievement and the personal and social growth of students.

MISSION

- To Promote Quality Education to Women at all levels.
- To provide students experiences in Mathematics that will empower them to succeed in a never changing society.
- To empower young women to face the challenges of life with courage and commitment.
- To equip them with enhanced employable skills.

Bloom's Taxonomy Based Assessment Pattern

K1-Remember; **K2**- Understanding; **K3**- Apply;

K4-Analyze;**K5**- Evaluate; **K6**- Creating.

Theory: 75 Marks

Test- I & II and ESE:

Knowledge Level	Section	Marks	Description	Total
K1,K2	A (Answer all)	10x01=10	MCQ/Define	75
K3, K4	B (Either or pattern)	05x07=35	Short Answers	
K5&K6	C (Answer 3 out of 5)	03x10=30	Descriptive/ Detailed	

Under Graduate Programme

Programme Outcomes:

PO1: Disciplinary Knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.

PO2: Critical Thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO3: Problem Solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

PO4: Analytical Reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints.

PO5: Scientific Reasoning: Ability to analyse, interpret and draw conclusions from quantitative / qualitative data; and critically evaluate ideas, evidence, and experiences from an open minded and reasoned perspective.

PO6: Self-directed & Lifelong Learning: Ability to work independently, identify and manage a project. Ability to acquire knowledge and skills, including "learning how to learn", through self-placed and self-directed learning aimed at personal development, meeting economic, social and cultural objectives.

Programme Specific Outcomes:

PSO1: Acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics.

PSO2: Understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.

PSO3: To prepare the students who will demonstrate respectful engagement with other's ideas, behaviors, beliefs and apply diverse frames of references to decisions and actions. To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.

Programme Educational Objectives:

PEO 1: To provide students with an awareness of skills in lifelong learning and self education.

PEO 2: To cultivate team work, technical writing, and oral communication skills.

PEO 3: To provide students with an appreciation of mathematical impact on society and the Professional responsibilities of mathematician.

Bloom's Taxonomy

K1: Remembering: Retrieving, recognizing, and recalling relevant knowledge from long-term memory.

K2: Understanding: Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining.

K3: Applying: Carrying out or using a procedure for executing, or implementing.

K4: Analyzing: Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing.

K5: Evaluating: Making judgments based on criteria and standards through critique and checking.

K6: Creating: Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing.



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(Affiliated to Periyar University, Approved by AICTE, Re-accredited with 'A+' Grade (3rd cycle) by NAAC)

(Recognized under section 2(f) and 12(B) of UGC Act, 1956)

Elayampalayam – 637 205. Tiruchengode, Namakkal Dt., Tamil Nadu

CURRICULUM DEVELOPMENT CELL (CDC)

Date: 27.03.2024

Curriculum structure 2024-25 onwards (UG)

(For candidates admitted during 2023-24 onwards)

Semester - III				Semester - IV			
S.No	Sub.code	Sub.Name	Credits	S.No	Sub.code	Sub.Name	Credits
1.	23U3LT03	F.Tamil	3	1.	23U4LT04	F.Tamil	3
2.	23U3LE03	English – III / Core	3	2.	23U4LE04	English – IV / Core	3
3.	23U3	Core-1	4	3.	23U4	Core-1	4
4.	23U3	Core-2	4	4.	23U4	Core-2	4
5.	23U3	DSE-1	4	5.	23U4	DSE-1	4
6.	23U3	NMEC-1	2	6.	23U4	NMEC-2	2
7.	23U3	Practical / Internship	2	7.	23U4	Practical / Internship	2
		Total	22			Total	22

Semester - V				Semester -VI			
S.No	Sub.code	Sub.Name	Credits	S.No	Sub.code	Sub.Name	Credits
1.	23U5	Core-1	5	1.	23U6	Core	5
2.	23U5	Core-2	5	2.	23U6	Core	5
3.	23U5	Core-3	5	3.	23U6	Core	5
4.	23U5	DSE-1	4	4.	23U6	DSE	4
5.	23U5	DSE-2	4	5.	23U6	DSE	4
6.	23U5	SBEC-1	2	6.	23U6	SBEC-2	2
7.	23U5	Practical / Internship / Mini Project	2	7.	23U6	Project	3
		Total	27	8.	23U6EX01	Ext.Activities	1
						Total	29

Note: Credits for Core & DSE may be changed, according to the total credits. (i.e. 140)

NMEC-1	As per Existing Norms	SBEC-1	Cyber security and Ethical Hacking
	Offered & Selected by all departments		Professional Ethics
NMEC-2	Human Rights	SBEC-2	Academic Writing and Academic portfolio
	Universal Human Values		
	Indian Knowledge System		



Dr. A. Malarvizhi
(CDC coordinator)

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN [AUTONOMOUS]
ELAYAMPALAYAM, TIRUCHENGODE-637205.**

DEPARTMENT OF MATHEMATICS

B.Sc.–MATHEMATICS

COURSE PATTERN AND SCHEME OF EXAMINATIONS UNDER OBE

(TANSCHE)

For the Candidates admitted from the year 2023-2024

ACADEMIC YEAR – 2024-25

SEM	SUBJECT CODE	COURSE	SUBJECT TITLE	Hours/Week	CREDIT	INT. MARK	EXT. MARK	TOT. MARK
I	23U1LT01	Language-I	Tamil-I	6	3	25	75	100
	23U1LE01	English-I	English-I	4	3	25	75	100
	23U1MAC01	Core Course-I	Algebra & Trigonometry	5	4	25	75	100
	23U1MAC02	Core Course-II	Differential Calculus	5	4	25	75	100
	23U1MADE01	Discipline Specific Elective Course- I	Numerical Methods with Applications	4	3	25	75	100
	23U1MAS01	Skill Enhancement Course - I	Bridge Mathematics	2	2	25	75	100
	23U1ENAC01	Ability Enhancement Compulsory Course - I	Soft skills for Effective Communication	2	2	25	75	100
	23U1VE01	Value Education	Health, Human values and Yoga	2	2	25	75	100
TOTAL				30	23	200	600	800

SEM	SUBJECT CODE	COURSE	SUBJECT TITLE	Hours/Week	CREDIT	INT. MARK	EXT. MARK	TOT. MARK
II	23U2LT02	Language-II	General Tamil - II	5	3	25	75	100
	23U2LE02	English-II	English - II	5	3	25	75	100
	23U2MAC03	Core Course-III	Analytical Geometry (Two & Three Dimensions)	5	4	25	75	100
	23U2MAC04	Core Course-IV	Integral Calculus	5	4	25	75	100
	23U2MADE02	Discipline Specific Elective Course- II	Discrete Mathematical Structures	4	3	25	75	100
	23U2MAS02	Skill Enhancement Course - II	Computational Mathematics	2	2	25	75	100
	23U2CSAC02	Ability Enhancement Compulsory Course - II	Office Automation	2	2	25	75	100
	23U2EVS01	EVS	Environmental Studies	2	2	25	75	100
TOTAL				30	23	200	600	800

SEM	SUBJECT CODE	COURSE	SUBJECT TITLE	Hours/Week	CREDIT	INT. MARK	EXT. MARK	TOT. MARK
III	23U3LT03	Language-III	Foundation Tamil - III	5	3	25	75	100
	23U3LE03	English – III	English - III	5	3	25	75	100
	23U3MAC05	Core Course-V	Vector calculus and its Applications	6	4	25	75	100
	23U3MAC06	Core Course-VI	Differential Equations and its Applications	6	4	25	75	100
	23U3MADE03	Discipline Specific Elective Course- III	Mathematical Statistics (Theory)	4	3	25	75	100
	24U3CSN01	Non Major Elective Course - I	Fundamentals of Artificial Intelligence	2	2	25	75	100
	23U3MADEP1	Practical	Mathematical Statistics Using R Programming (Practical)	2	2	40	60	100
TOTAL				30	21	190	510	700

SEM	SUBJECT CODE	COURSE	SUBJECT TITLE	Hours/Week	CREDIT	INT. MARK	EXT. MARK	TOT. MARK
IV	23U4LT04	Language-IV	Foundation Tamil - IV	5	3	25	75	100
	23U4LE04	English – IV	English - IV	5	3	25	75	100
	23U4MAC07	Core Course-VII	Industrial Statistics	5	4	25	75	100
	23U4MAC08	Core Course-VIII	Elements of Mathematical Analysis	6	4	25	75	100
	23U4MADE04	Discipline Specific Elective Course-IV	Transformation Techniques	5	3	25	75	100
	23U4	NMEC-2	Human Rights	2	2	25	75	100
	23U4MAS03	Skill Enhancement Course - III	Quantitative Aptitude	2	2	25	75	100
	Internship Training during summer vacation.(Credits shall be awarded in V Semester mark sheet)				-	-	-	-
TOTAL				30	21	175	525	700

SEM	SUBJECT CODE	COURSE	SUBJECT TITLE	Hours/Week	CREDIT	INT. MARK	EXT. MARK	TOT. MARK
V	23U5MAC09	Core Course - IX	Abstract Algebra	6	5	25	75	100
	23U5MAC10	Core Course - X	Real Analysis	6	5	25	75	100
	23U5MAC11	Core Course- XI	Mathematical Modelling	5	4	25	75	100
	23U5MADE05	Discipline Specific Elective Course- V	Mathematical Methods using C Programming (Theory)	4	3	25	75	100
	23U5MADE06	Discipline Specific Elective Course- VI	Operations Research - I	5	3	25	75	100
	23U5	SBEC - I	Professional Ethics	2	2	25	75	100
	23U5MADEP2	Practical	Mathematical Methods using C Programming (Practical)	2	2	25	75	100
	23U4MAIN01	Practical / Internship	Internship	-	2	-	-	-
TOTAL				30	26	175	525	700

SEM	SUBJECT CODE	COURSE	SUBJECT TITLE	Hours/Week	CREDIT	INT. MARK	EXT. MARK	TOT. MARK
VI	23U6MAC12	Core Course - XII	Linear Algebra	5	5	25	75	100
	23U6MAC13	Core Course - XIII	Complex Analysis	5	5	25	75	100
	23U6MAC14	Core Course - XIV	Mechanics	5	4	25	75	100
	23U6MADE07	Discipline Specific Elective Course- VII	Graph Theory with Applications	5	3	25	75	100
	23U6MADE08	Discipline Specific Elective Course- VIII	Operations Research - II	5	3	25	75	100
	23U6	SBEC-2	Academic Writing and Academic portfolio	2	2	25	75	100
	23U6MAPR01	Project	Project	3	3	40	60	100
	23U6EX01	Ext. Activities	Ext. Activities	-	1	-	-	-
TOTAL				30	26	190	510	700
GRAND TOTAL				180	140	1130	3270	4400

Elective Course for the I year B. Sc Mathematics:

Name of the course	Paper Code
Numerical Methods with Applications	23U1MADE01
Discrete Mathematical Structures	23U2MADE02
Allied Physics -I	23U1PHA01
Allied Physics -II	23U2PHA02
Allied Physics Practicals -I	23U1PHAP01
Allied Physics Practicals -II	23U2PHAP02
Combinatorics	23U2MADE09

Elective Course for the II year B. Sc Mathematics:

Name of the course	Paper Code
Mathematical Statistics Theory	23U3MADE03
Mathematical Statistics Practical	23U3MADEP1
Transformation Techniques	23U4MADE04
Allied Chemistry-I	23U3CHGE03
Allied Chemistry-II	23U4CHGE04
Allied Chemistry Practical-I	23U3CHGEP1
Allied Chemistry Practical-II	23U4CHGEP2

Elective Course for the III year B. Sc Mathematics: Group-I

Name of the course	Paper Code
Mathematical Methods using C Programming (Theory)	23U5MADE05
Mathematical Methods using C Programming (Practical)	23U5MADEP2
Operations Research - I	23U5MADE06
Difference Equations with Applications	23U5MADE10

Elective Course for the III year B. Sc Mathematics: Group-II

Name of the course	Paper Code
Graph Theory with Applications	23U6MADE07
Operations Research - II	23U6MADE08
Number Theory	23U6MADE11
Financial Mathematics	23U6MADE12
Astronomy	23U6MADE13

Non Major Elective Courses for Other Branch Students

- 21U3MAN01 - Quantitative Aptitude For All
- 21U3MAN02 - Linear Programming
- 21U4MAN03 - Mathematics For Bank Examinations
- 21U4MAN04 - Numerical Methods

Title of the Course		ALGEBRA & TRIGONOMETRY					
Paper Number		CORE M1					
Category	Core	Year	I	Credits	4	Course Code	23U1MAC01
		Semester	I				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		4		1		--	5
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Basic ideas on the Theory of Equations, Matrices and Number Theory. • Knowledge to find expansions of trigonometry functions, solve theoretical and applied problems. 					
Course Outline		<p>Unit I: Reciprocal Equations-Standard form–Increasing or decreasing the roots of a given equation- Removal of terms, Approximate solutions of roots of polynomials by Horner ’ s method – related problems.</p> <p>(Book1 – Chapter6: Sections 16,17,19,30). (12 HRS)</p>					
		<p>Unit II: Summation of Series: Binomial– Exponential –Logarithmic series (Theorems without proof) – Approximations - related problems.</p> <p>(Book1 – Chapter3: Sections 10,14; Chapter4: Sections-1,2,3,5,7,8,9. 11). (12 HRS)</p>					
		<p>Unit III: Inverse of a square matrix up to order 3, Characteristic equation –Eigen values and Eigen Vectors-Similar matrices - Cayley – Hamilton Theorem (Statement only) - Finding powers of square matrix, Diagonalization of square matrices - related problems.</p> <p>(Book2 – Chapter2: Sections -8,16). (12 HRS)</p>					

	<p>Unit IV: Expansions of $\sin^n \theta$, $\cos^n \theta$ in powers of $\sin \theta$, $\cos \theta$ - Expansion of $\tan^n \theta$ in terms of $\tan \theta$, Expansions of $\cos^n \theta$, $\sin^n \theta$, $\cos^m \theta \sin^n \theta$ - Expansions of $\tan(\theta_1 + \theta_2 + \dots + \theta_n)$ - Expansions of $\sin \theta$, $\cos \theta$ and $\tan \theta$ in terms of θ - related problems.</p> <p>(Book3 - Chapter3: Sections 1 to 5). (12 HRS)</p>
	<p>Unit V: Hyperbolic functions – Relation between circular and hyperbolic functions Inverse hyperbolic functions, Logarithm of complex quantities, Summation of trigonometric series - related problems. (Book3 - Chapter4; Chapter5; Chapter6: Sections 1,3,3.1 Related problems.) (12 HRS)</p>
<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial hour)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, problem solving, analytical ability, professional competency, professional communication and transferable skill.</p>
<p>Recommended Text</p>	<ol style="list-style-type: none"> 1. Manickavasagam Pillai, T.K., T. Natarajan and Ganapathy KS – Algebra Vol-I, Viswanathan Publishers and Printers Pvt Ltd., - 2008. 2. Manickavasagam Pillai, T.K., T. Natarajan and Ganapathy KS – Algebra Vol-II, Viswanathan Publishers and Printers Pvt Ltd., - 2008. 3. Manichavasagam Pillai, T.K. and S. Narayanan, Trigonometry– Viswanathan Publishers and Printers Pvt. Ltd. 2013.
<p>Reference Books</p>	<ol style="list-style-type: none"> 1. W.S. Burnstine and A.W. Panton, Theory of equations

	<ol style="list-style-type: none"> 2. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007 3. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005 4. C.V.Durell and A. Robson, Advanced Trigonometry, Courier Corporation, 2003 5. J.Stewart, L. Redlin, and S. Watson, Algebra and Trigonometry, Cengage Learning, 2012. 6. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010.
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Website and e-Learning Source	https://nptel.ac.in
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Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Classify and Solve reciprocal equations

CLO 2: Find the sum of binomial, exponential and logarithmic series

CLO 3: Find Eigen values, eigen vectors, verify Cayley – Hamilton theorem and diagonalize agiven matrix

CLO 4: Expand the powers and multiples of trigonometric functions in terms of sine and cosine

CLO 5: Determine relationship between circular and hyperbolic functions and the summation oftrigonometric series

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	2	1	3	1	-	-	3	2	1
CLO3	3	1	3	1	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	-	-	3	2	1

Title of the Course		DIFFERENTIAL CALCULUS					
Paper Number		CORE M2					
Category	Core	Year	I	Credits	4	Course Code	23U1MAC02
		Semester	I				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		4		1		--	5
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • The basic skills of differentiation, successive differentiation, and their applications. • Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates and in solving related problems. 					
Course Outline		<p>UNIT-I: Successive Differentiation: Introduction (Review of basic concepts) – The n^{th} derivative – Standard results – Fractional expressions – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the n^{th} derivative of a product. (Chapter3: Sections 1.1 to 1.6 and 2.1, Related problems.) (12 HRS)</p>					
		<p>UNIT-II: Partial Differentiation: Partial derivatives – Successive partial derivatives – Function of a function rule – Total differential coefficient – A special case – Implicit Functions. (Chapter8: Sections 1.1 to 1.5.) (12 HRS)</p>					
		<p>UNIT-III: Partial Differentiation (Continued): Homogeneous functions – Partial derivatives of a function of two variables – Maxima and Minima of functions of two variables - Lagrange 's method of undetermined multipliers. (Chapter8: Sections 1.6, 1.7 and Sections 4, 5.) (12 HRS)</p>					

	<p>UNIT-IV: Envelope: Method of finding the envelope – Another definition of envelope – Envelope of family of curves which are quadratic in the parameter.</p> <p>(Chapter10: Sections 1.1 to 1.4.) (12 HRS)</p>
	<p>UNIT-V:Curvature: Definition of Curvature – Circle, Radius and Centre of Curvature –Cartesian formula for the radius of curvature – The coordinates of the centre of curvature- Evolutes and Involutives – Radius of Curvature in Polar Co-ordinates.</p> <p>(Chapter10: Sections 2.1 to 2.6) (12 HRS)</p>
TOTAL HOURS	60 HRS
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC // TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial hour)</p>
Skills acquired from this course	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
Recommended Text	<p>1. S. Narayanan and T.K. Manicavachagom Pillay, Calculus-Volume I, (2004), S. Viswanathan Printers Pvt. Ltd.</p>
Reference Books	<ol style="list-style-type: none"> 1. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons,Inc., 2002. 2. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2010. 3. M.J. Strauss, G.L. Bradley and K. J. Smith, Calculus, 3rd Ed., Dorling Kindersley (India) P. Ltd. (Pearson Education), Delhi, 2007. 4. R. Courant and F. John, Introduction to Calculus and Analysis

	(Volumes I & II), Springer- Verlag, New York, Inc., 1989. 5. T. Apostol, Calculus, Volumes I and II. 6. S. Goldberg, Calculus and mathematical analysis.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Find the nth derivative, form equations involving derivatives and apply Leibnitzformula

CLO 2: Find the partial derivative and total derivative coefficient

CLO 3: Determine maxima and minima of functions of two variables and to use the Lagrange's method of undetermined multipliers

CLO 4: Find the envelope of a given family of curves

CLO 5: Find the evolutes and involutes and to find the radius of curvature using polar co-ordinates

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	2	1	3	-	-	-	3	2	1
CLO3	3	2	3	2	-	-	3	2	1
CLO4	3	2	3	2	1	-	3	2	1
CLO5	3	2	3	2	1	-	3	2	1

Title of the Course		NUMERICAL METHODS WITH APPLICATIONS					
Paper Number		Discipline Specific Elective Course 1					
Category	Core	Year	I	Credits	3	Course Code	23U1MADE01
		Semester	I				
Instructional Hours per week		Lecture	Tutorial		Lab Practice	Total	
		3	1		--	4	
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Method of successive approximation • Finite Differences • Numerical Differentiation & Numerical Integration 					
Course Outline		UNIT-I					
		Method of successive approximation-The Method of false position-Newton Raphson Method-Generalized Newton's Method-Muller's Method. Chapter 2 (sec2.1 to 2.5 and 2.8) (9 HRS)					
		UNIT-II					
		Finite Differences-Forward Differences and Backward Differences-Symbolic relations and Separation of symbols-differences of a polynomial-Newton's formulae for Interpolation-Central difference Interpolation formulae-Gauss's central difference formulae. Chapter 3 (sec 3.3 ,3.5 to 3.7.1) (9 HRS)					
		UNIT-III					
		Numerical Differentiation--Numerical Integration-Trapezoidal rule-Simpson's 1/3 rule-Simpson's 3/8 rule-Boole's and Weddle's rule. Chapter 5 (sec 5.2(5.2.1),sec 5.4(5.4.1 to 5.4.4)) (9 HRS)					

	<p>UNIT-IV</p> <p>Elimination Method- Gauss Jordan Method--Method of factorization-Solution of linear System-Iterative methods-Jacobian ' s Method – Gauss Seidal Method. Chapter 6 (sec 6.3(6.3.1 to 6.3.3,(6.3.6, 6.3.7), sec 6.4) (9 HRS)</p>
	<p>UNIT-V</p> <p>Solution of Taylor's Series-Picard's Method of Successive approximations- Euler's Method-RungeKutta Methods II order and III order. Chapter 7(sec7.2 to 7.5) (9 HRS)</p>
TOTAL HOURS	45 HRS
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)</p>
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	<p>1. S. S. Sastry, "<i>Introductory Methods of Numerical Analysis</i>", Prentice Hall of India Pvt. Ltd.,New Delhi, 2003.</p> <p>2. P.Kandasamy, K.Thilgavathy, K.Gunavathi, "<i>Numerical Methods</i>", 3rd Edition, 2012.</p>
Reference Books	<p>1. E.Balagurusamy, "<i>Numerical Methods</i>",Tata Mcgraw Hill Ltd., 1999.</p> <p>2. Richard L.Burden, J.Douglas Favies, "<i>Numerical Analysis</i>", NelsonEducation 2001.</p> <p>3. Arunkumar jalan, utpal sarkar, "<i>Numerical Methods</i>",Universities press(India) privatelimited, 2015.</p>

Website and e-Learning Source	https://nptel.ac.in https://ocw.mit.edu , https://www.mathscard.co.uk
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Course Learning Outcome (for Mapping with POs and PSOs)

Students will able

CLO 1: To recollect the basic concept of Newton’s method

CLO 2: To understand the concept of difference method.

CLO 3: To gain knowledge about types numerical differentiation and integration

CLO 4: To understand the Linear system of equations.

CLO 5: To analyze the concepts of Runge kutta methods.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	2	3	2	1	1	3	3	2
CLO2	3	2	3	2	1	1	3	3	2
CLO3	3	2	3	2	1	1	3	3	2
CLO4	3	2	3	2	1	1	3	3	2
CLO5	3	2	3	2	1	1	3	3	2

Title of the Course		Bridge Mathematics					
Paper Number		Skill Enhancement Course - I					
Category	Core	Year	I	Credits	2	Course Code	23U1MAS01
		Semester	I				
Instructional Hours per week		Lecture	Tutorial		Lab Practice	Total	
		2	-		--	2	
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<p>To bridge the gap and facilitate transition from higher secondary to tertiary education;</p> <p>To instill confidence among stakeholders and inculcate interest for Mathematics;</p>					
Course Outline		UNIT-I: Algebra: Binomial theorem, General term, middle term, problems based on these concepts (6 HRS)					
		Unit -II: Sequences and series (Progressions). Fundamental principle of counting. Factorial n. (6 HRS)					
		Unit- III: Permutations and combinations, Derivation of formulae and their connections, simple applications, combinations with repetitions, arrangements within groups, formation of groups. (6 HRS)					
		Unit-IV: Trigonometry: Introduction to trigonometric ratios, proof of $\sin(A+B)$, $\cos(A+B)$, $\tan(A+B)$ formulae, multiple and sub multiple angles, $\sin(2A)$, $\cos(2A)$, $\tan(2A)$ etc., transformations sum into product and product into sum formulae, inverse trigonometric functions, sine rule and cosine rule (6 HRS)					

	Unit-V: Calculus: Limits, standard formulae and problems, differentiation, first principle, uv rule, u/v rule, methods of differentiation, application of derivatives, integration - product rule and substitution method. (6 HRS)
	TOTAL HOURS- 30 HRS
Recommended Text	1. NCERT class XI and XII text books. 2. Any State Board Mathematics text books of class XI and XII

Website and e-Learning Source	https://nptel.ac.in
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Course Learning Outcome

After completion of this course successfully, the students will be able to

CLO1: Prove the binomial theorem and apply it to find the expansions of any $(x + y)^n$ and also, solve the related problems

CLO2: Find the various sequences and series and solve the problems related to them. Explain the principle of counting.

CLO3: Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations

CLO4: Explain various trigonometric ratios and find them for different angles, including sum of the angles, multiple and submultiple angles, etc. Also, they can solve the problems using the transformations.

CLO5: Find the limit and derivative of a function at a point, the definite and indefinite integral of a function. Find the points of min/max of a function.

Mapping of Course Learning Outcomes (CLOs) with Programme Learning Outcomes (PLOs) and Programme Specific Outcomes (PSOs)

	POs						PSOs	
	1	2	3	4	5	6	1	2
CLO1	1	1	1	1	1	1	1	1
CLO2	2	1	1	2	2	1	2	1
CLO3	2	1	1	2	2	1	2	1
CLO4	1	1	1	1	1	1	2	1
CLO5	1	1	1	1	1	1	2	1

Title of the Course		ANALYTICAL GEOMETRY (Two & Three Dimensions)					
Paper Number		CORE M3					
Category	Core	Year	I	Credits	4	Course Code	23U2MAC03
		Semester	II				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		4		1		--	5
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Necessary skills to analyze characteristics and properties of two- and three-dimensional geometric shapes. • To present mathematical arguments about geometric relationships. • To solve real world problems on geometry and its applications. 					
Course Outline		UNIT-I: Pole, Polar-conjugate points and conjugate lines—diameters—conjugate diameters of an ellipse—semidiameters—conjugate diameters of hyperbola. (Book1: Chapter9, 10) (12 Hrs)					
		UNIT-II: Polar coordinates: General polar equation of straight line – Polar equation of a circle given a diameter, Equation of a straight line, circle, conic—Equation of chord, tangent, normal. Equations of the Asymptotes of a hyperbola. (Book2: Chapter9) (12 Hrs)					
		UNIT-III: System of Planes—Length of the perpendicular—Orthogonal projection. (Book3: Chapter2: Sections2.5,2.7,2.9) (12 Hrs)					
		UNIT-IV: Representation of line—angle between a line and a plane –co – planar lines—shortest distance between two skew lines –length of the perpendicular—intersection of three planes. (Book3: Chapter3: Sections3.1,3.2,3.4,3.6,3.7,3.8) (12 Hrs)					

	<p>UNIT-V: Equation of a sphere-general equation-section of a sphere by a plane-equation of the circle- tangent plane- angle of intersection of two spheres-condition for the orthogonality-radical plane.(Book3: Chapter6:Sections6.1,6.2,6.3,6.4,6.6,6.7,6.8) (12 Hrs)</p>
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<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
<p>Recommended Text</p>	<ol style="list-style-type: none"> 1. Vittal P.R. and Malini V, Algebra, Analytical Geometry & Trigonometry, Margam Publications, India.2018. 2. Manicavachagom Pillay T.K. and Natarajan T, A Text book of Analytical Geometry Part I-Two Dimensions, Divya Subramanian for Ananda Book Depot. 1996. 3. Shanti Narayan and Mittal P.K., Analytical Solid Geometry, S Chand Publishing, 2021.

ReferenceBooks	<ol style="list-style-type: none"> 1. S.L.Loney, Co-ordinate Geometry. 2. RobertJ.T.Bell,Co-ordinateGeometryofThreeDimensions. 3. William F. Osgood and William C. Graustein, Plane and Solid Analytic Geometry, Macmillan Company, NewYork, 2016. 4. Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010. 5. Robert C. Yates, Analytic Geometry with Calculus, Prentice Hall, Inc., New York, 1961. 6. Earl W. Swokowski and Jeffery A. Cole, Algebra and Trigonometry with Analytic Geometry, Twelfth Edition, Brooks/Cole, Cengage Learning, CA, USA, 2010. 7. William H. McCrea, Analytical Geometry of ThreeDimensions, Dover Publications, Inc, New York, 2006. 8. JohnF.Randelph,CalculusandAnalyticGeometry, Wadsworth Publishing Company, CA, USA, 1969. 9. RalphPalmerAgnew,AnalyticGeometryandCalculuswith Vectors, McGraw-Hill Book Company, Inc. New York, 1962.
Websiteand e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with Pos and PSOs)

Students will be able to

CLO 1: Find pole, polar for conics, diameters, conjugate diameters for ellipse .

CLO2:Find the polar equations of straight line and circle, equations of chord, tangent and normal .

CLO3:Explain in detail the system of Planes

CLO 4:Explain in detail the system of Straight lines

CLO5:Explain in detail the system of Spheres

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	2	2	2	1	-	-	3	2	1
CLO2	2	2	2	1	-	-	3	2	1
CLO3	3	2	2	1	-	-	3	2	1
CLO4	3	2	3	1	-	-	3	2	1
CLO5	3	2	3	1	-	-	3	2	1

Title of the Course		INTEGRAL CALCULUS					
Paper Number		CORE M4					
Category	Core	Year	I	Credits	4	Course Code	23U2MAC04
		Semester	II				
Instructional Hours perweek		Lecture		Tutorial		Lab Practice	Total
		4		1		--	5
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Knowledge on integration and its geometrical applications, double, triple integrals and improper integrals. • Knowledge about Beta and Gamma functions and their applications. • Skills to Determine Fourier series expansions. 					
Course Outline		<p>UNIT-I: Reduction formulae -Types, integration of product of powers of algebraic and trigonometric functions, integration of product of powers of algebraic and logarithmic functions - Bernoulli's formula.</p> <p>(Chapter1:Sections13and14) (12 HRS)</p>					
		<p>UNIT-II: Multiple Integrals - definition of double integrals -evaluation of double integrals – double integrals in polar coordinates - Change of order of integration.</p> <p>(Chapter5:Sections1,2.1, 2.2and3.1) (12 HRS)</p>					
		<p>UNIT-III: Triple integrals –applications of multiple integrals -volumes of solids of revolution - areas of curved surfaces – change of variables - Jacobian.</p> <p>(Chapter5:Sections4,5.1,5.2,5.3,6.1,7andChapter6:1.1,1.2) (12 HRS)</p>					

	<p>UNIT-IV: Beta and Gamma functions – infinite integral - definitions – recurrence formula of Gamma functions – properties of Beta and Gamma functions- relation between Beta and Gamma functions - Applications.</p> <p>(Chapter7:Sections2.1,2.2,2.3, 3,4, and 6.) (12 HRS)</p>
	<p>UNIT-V: Geometric Applications of Integration – Areas under plane curves: Cartesian coordinates-Area of a closed curve – Areas in polar coordinates-Trapezoidal rule – Simpson’s rule and Physical Applications of Integral calculus–Centroid–Centre of mass of an arc</p> <p>- Centre of mass of a plane area- Centroid of a solid of revolution – Centroid of a surface of revolution .</p> <p>(Chapter2:Sections1.1to1.4,2.1,2.2andChapter 3: 1.1to1.5Simple Applications) (12 HRS)</p>
<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination Question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial hour)</p>
<p>Skills acquired From this course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
<p>Recommended Text</p>	<p>1. Narayanan S and Manicavachagom Pillay T.K.Calculus-Volume II, (2006), S. Viswananthan Printers Pvt. Ltd.</p>

Reference Books	<ol style="list-style-type: none"> 1. H. Anton, I. Birens and S.Davis,Calculus,John Wiley and Sons, Inc., 2002. 2. G.B.Thomas and R.L.Finney,Calculus,Pearson Education,2007. 3. D.Chatterjee,Integral Calculus and Differential Equations,Tata- McGraw Hill Publishing Company Ltd. 4. P. Dyke, An Introduction to Laplace Transforms and Fourier Series, Springer Under graduate Mathematics Series,2001(second edition).
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with Pos and PSOs)

Students will be able to

CLO1: Determine the integrals of algebraic, trigonometric and logarithmic functions and to find the reduction formulae

CLO 2: Evaluate double and triple integrals and problems using change of order of integration

CLO 3: Solve multiple integrals and to find the areas of curved surfaces and volumes of solid of revolution

CLO4: Explain beta and gamma functions and to use the min solving problems of integration

CLO5: Explain Geometric and Physical applications of integral calculus

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	-	-	-	3	2	1
CLO2	3	1	3	-	-	-	3	2	1
CLO3	3	1	3	-	-	-	3	2	1
CLO4	3	1	3	-	-	-	3	2	1
CLO5	3	1	3	-	2	1	3	2	1

Programme code	B.Sc	Programme Title	Bachelor of Science (Mathematics)	
Course Code	23U2MADE02	Title	Batch	2023-2026
		ELECTIVE : DISCRETE MATHEMATICAL STRUCTURES	Semester	II
Hrs/Week	4		Credits	03

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To gain the knowledge about predicates, quantifiers and logical words.	K1, K2
CO2	To develop the concept of Normal forms.	K4
CO3	To understand the theory of Peano axiom.	K2, K3
CO4	To analyze Semi groups and Monoids.	K4, K5
CO5	To apply the concept of Boolean Algebra.	K3, K4

UNIT I: (9 Hours)

Mathematical Logic – Statements and Notations – Connectives – Negation – Conjunction – Disjunction – statement Formulas and Truth Table – Conditional and Biconditional – Well formed Formulas – Tautologies.

UNIT II: (9 Hours)

Normal Forms – Disjunctive Normal Forms – Conjunctive Normal Forms – Principal Disjunctive Normal Forms – Principal Conjunctive Normal Forms – Ordering and Uniqueness of Normal Forms. The Theory of inference for the statement calculus – validity using truth table – Rules of Inference – Consistency of Premises and indirect method of proof.

UNIT III: (9 Hours)

Relations & ordering – Relations – Properties of binary relation in a set – Functions – Definition & Introduction – Composition of Functions – Inverse function – Binary and n-array operations – Hashing Functions – Natural numbers – Peano Axioms & Mathematical Induction – Cardinality

UNIT IV:**(9 Hours)**

Algebraic systems – Definition & Examples – Semi groups and monoids – definition and examples – homomorphism of semi groups & monoids – sub semi groups & sub monoids – Grammars – Formal Definition of a Language – Notions of Syntax Analysis.

UNIT V:**(9 Hours)**

Lattices as partially ordered sets: Definition and Examples – some properties of Lattices – Lattices as Algebraic systems – sub Lattices – Direct product and homomorphism.

Boolean Algebra: Definition and Examples – sub algebra, Direct product and homomorphism – Boolean Functions – Boolean Forms and Free Boolean Algebras – Values of Boolean Expression and Boolean Functions .

TOTAL :45 Hours

Power point Presentations, Seminar ,Quiz, Assignment
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TEXT BOOK :

J.P.Trembly, R. Manohar, “Discrete mathematical structures with applications to computerscience”, Tata Mc Graw Hill, , 2013.

REFERENCE BOOKS :

- 1. Prof.V.Sundaresan, K.S.Ganapathy Subramaniyan, K.Ganesan, “Discrete Mathematics”,** Tata McGraw Hill, 2000.
- 2. L.Lovarz, J.Pelikan, K.Vexztergombi, “Discrete Mathematics”,** Springer Int. Edition, 2002.
- 3. N.Chandrasekaran, M.Uma parvathi, “Discrete Mathematics”,** PHI Learning P. Ltd., 2010.

ONLINE SOURCES :

1. <https://ocw.mit.edu>.
2. <https://nptel.ac.in>
3. <https://swayam.gov.in>

Mapping with Programme Outcomes

PO															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO															
CO1	S	M	L	S	S	M	M	M	M	L	S	M	L	L	S
CO2	S	L	S	M	M	L	L	M	M	L	M	L	L	L	S
CO3	S	M	S	S	S	M	S	S	L	M	L	S	M	S	S
CO4	S	M	S	S	S	S	M	M	M	L	S	S	M	L	S
CO5	M	M	S	S	S	S	S	L	L	L	M	M	M	L	S

S - Strong; M - Medium; L – Low

23U2MAS02	COMPUTATIONAL MATHEMATICS		Credits 2
Year &Semester: I YEAR&II SEMESTER	Course Category	SEC	Total:(L+T+P) Per week:1+1= 2
Course Objective			
<p>1.To introduce students to computational mathematics and its applications in solving mathematical problems.</p> <p>2. To familiarize students with the basics of Scilab programming language and its use in numerical computations.</p> <p>3. To teach students how to implement numerical algorithms for solving mathematical problems using Scilab.</p> <p>4. To enable students to use computational methods to solve mathematical problems and interpret the results obtained</p>			
UNIT	Details		No. of Hours
I	<p>Introduction to Scilab – Scilab Environment: Manipulating the command line - Variables in Memory - Startup Commands - TheScilabMenu Bar–Toolboxes</p> <p>Vectors :Initialising vectors in Scilab -Mathematical operations on vectors - Relational operations on vectors - Logical operations on vectors</p> <p>Functions: Built-in logical functions -Elementary Mathematical Functions- Mathematical functions on scalars</p>		5
II	<p>Matrices : Introduction - Arithmetic operators for Matrices – Basic matrix processing</p> <p>Programming in Scilab : Introduction - Variables & Variable names - Assignment statements - Arithmetic, Relational & Logical operators - Input & Output - Flow control/branching /conditional statements –Break and continue-Handling Matrices With Loops</p>		5

III	Scripts - The Concept of Functions - User Defined Functions – Special Function command Graphic output :Introduction - 2d Plotting - - Function versions for graphic commands -3d plotting	4
IV	Numerical Methods using SCILAB [Concepts, Problem &Scilab code] Solution of Algebraic and Transcendental Equation: Bisection method -Newton- Raphson method – Regula Falsi method – Secant method Interpolation: Finite Difference Operators – Newton’s Gregory Forward Interpolation Method, - Newton’s Gregory backward Interpolation Method-Lagrange interpolation method	8
V	Numerical Differentiation: Equal interval –Unequal Interval Numerical Integration: Newton Cotes formula- Trapezoidalrule -Simpson's1/3 rule–Simpson's3/8 rule-Monte Carlo method	8
Total		30

Course Outcomes

CO	On completion of this course, students will
1	Develop an understanding of numerical methods for solving mathematical problems.
2	Acquire knowledge of programming concepts and the basics of Scilab language.
3	Apply numerical algorithms to solve mathematical problems using Scilab.
4	Implement and test numerical algorithms using Scilab.
5	Analyze and interpret the results of numerical differentiation and integrations

TextBook

1.SCILAB (A Free Software to MATLAB)- Author: Achuthsankar S Nair & Hema Ramchandran:- S. Chand Publishing-:2012

Unit I: Chapter 2–2.1,2.2,2.5, 2.8,2.9:Chapter3– 3.2to3.8

Unit II: Chapter4–4.1,4.2,4.3; Chapter5–5.1 to5.8

Unit III: Chapter5–5.9to5.12 :Chapter8 –8.1– 8.4

2.NUMERICAL METHODS KIT: FOR MATLAB, SCILAB AND OCTAVE USERS by Rohan Verma

Unit IV: Chapter1 &2

Unit V: Chapter 4&5

REFERENCE BOOK

1	Introduction to Scilab: For Engineers and Scientists.-Sandeep Nagar
2.	Computing in Scilab- ChetanaJain –Cambridge University
3.	COMPUTER-BASED NUMERICAL & STATISTICAL TECHNIQUES - M.GOYAL- INFINITY SCIENCE PRESS LLC

Web Resources

1.	https://www.scilab.org/tutorials - ScilabTutorials
2	https://egyankosh.ac.in/bitstream/123456789/88092/1/Unit-15.pdf
3	https://www.edx.org/course/scilab-programming-for-beginners
4	https://www.scilab.org/sites/default/files/Scilab_beginners.pdf
5	https://spoken-tutorial.org/tutorial-search/?search_foss=Scilab&search_language=English Scilab Spoken Tutorials

Title of the Course		VECTOR CALCULUS AND ITS APPLICATIONS					
Paper Number		CORE M5					
Category	Core	Year	II	Credits	4	Course Code	23U3MAC05
		Semester	III				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Knowledge about differentiation of vectors and on differential operators. Knowledge about derivatives of vector functions. • Skills in evaluating line, surface and volume integrals. • The ability to analyze the physical applications of derivatives of vectors. 					
Course Outline		<p>UNIT-I: Vector point function - Scalar point function - Derivative of a vector and derivative of a sum of vectors - Derivative of a product of a scalar and a vector point function - Derivative of a scalar product and vector product.</p> <p>(Chapter1: Sections 1.1 to 1.5) (12Hrs)</p> <p>UNIT-II: The vector operator del ' , The gradient of a scalar point function - Divergence of a vector - Curl of a vector - solenoidal and irrotational vectors – simple applications.</p> <p>(Chapter2: Sections 2.1 to 2.7.) (12Hrs)</p> <p>UNIT-III: Laplacian operator, Vector identities - Line integral - simple problems.</p> <p>Chapter2: Sections 2.8 and Chapter3: 3.1, 3.2, 3.3, 3.4) (12Hrs)</p> <p>UNIT-IV: Surface integral - Volume integral – Applications.</p> <p>(Chapter3: 3.5, 3.6) (12Hrs)</p>					

	UNIT-V: Gauss divergence Theorem, Stoke's Theorem, Green's Theorem in two dimensions – Applications to real life situations. (Chapter4: 4.1 to 4.5) (12Hrs)
	TOTAL: 60 HRS

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill.
Recommended Text	1. Duraipandian, P and Laxmi duraipandian - Vector Analysis (Revised Edition-Reprint 2005) Emerald Publishers.
Reference Books	1. J.C. Susan ,Vector Calculus, , (4th Edn.) Pearson Education, Boston, 2012. 2. A. Gorguis, Vector Calculus for College Students, Xilbius Corporation, 2014. 3. J.E. Marsden and A. Tromba ,Vector Calculus, , (5 th edn.) W.H. Freeman, New York, 1988.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Find the derivative of vector and sum of vectors, product of scalar and vector point function and to Determine derivatives of scalar and vector products

CLO 2: Applications of the operator ∇ and to Explain solenoidal and ir-rotational vectors

CLO 3: Solve simple line integrals

CLO 4: Solve surface integrals and volume integrals

CLO 5: Verify the theorems of Gauss, Stoke's and Green's(Two Dimension)

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	2	3	1	-	-	3	2	1
CLO2	3	2	3	1	2	-	3	2	1
CLO3	3	3	3	3	-	-	3	3	1
CLO4	3	3	3	3	-	-	3	3	1
CLO5	3	3	3	3	2	-	3	3	1

Title of the Course		DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS					
Paper Number		CORE M6					
Category	Core	Year	II	Credits	4	Course Code	23U3MAC06
		Semester	III				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Knowledge about the methods of solving Ordinary and Partial Differential Equations. • The understanding of how Differential Equations can be used as a powerful tool in solving problems in science. 					
Course Outline		<p>UNIT-I: Ordinary Differential Equations: Variable separable - Homogeneous Equation-Non-Homogeneous Equations of first degree in two variables -Linear Equation - Bernoulli's Equation-Exact differential equations.</p> <p>(Chapter2: Sections 1 to 6) (12Hrs)</p> <p>UNIT-II: Equation of first order but of higher degree: Equation solvable for dy/dx- Equation solvable for y-Equation solvable for x- Clairauts ' form - Linear Equations with constant coefficients-Particular integrals of algebraic, exponential, trigonometric functions and their products.</p> <p>(Chapter4: Sections 1,2 ,3 and Chapter5: 1 to 4) (12Hrs)</p> <p>UNIT-III: Simultaneous linear differential equations- Linear Equations of the Second Order -Complete solution in terms of a known integrals-Reduction to the Normal form-Change of the Independent Variable-Method of Variation of Parameters. (Chapter6 and Chapter 8: Sections 1 to 4) (12Hrs)</p>					

	<p>UNIT-IV: Partial differential equation: Formation of PDE by Eliminating arbitrary constants and arbitrary functions – complete integral – singular integral-General integral-Lagrange’s Linear Equations –Simple Applications. (Chapter12: 1,2,3, and 4) (12Hrs)</p> <p>UNIT-V: Special methods – Standard forms-Charpit’s Methods – Simple Applications (Chapter12: 5, and 6) (12Hrs)</p> <p>TOTAL: 60 HRS</p>
<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
<p>Recommended Text</p>	<p>1. Narayanan S and Manicavachagom Pillay T.K. Differential equations and its application, 2006, S. Viswananthan Printers Pvt. Ltd.</p>

Reference Books	<ol style="list-style-type: none"> 1. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984. 2. I.Sneddon, Elements of Partial Differential Equations, McGraw-Hill, International Edition, 1967. 3. G.F. Simmons, Differential equations with applications and historical notes, 2ndEd, Tata Mcgraw Hill Publications, 1991. 4. D.A. Murray, Introductory course in Differential Equations, Orient and Longman 5. H.T. H.Piaggio, Elementary Treaties on Differential Equations and their applications, C.B.S Publisher & Distributors, Delhi,1985. 6. Horst R. Beyer, Calculus and Analysis, Wiley, 2010. 7. Braun, M. Differential Equations and their Applications. (3rd Edn.), Springer- Verlag, New York. 1983. 8. TynMyint-U and Lognath Debnath. Linear Partial Differential Equations for Scientists and Engineers. (4th Edn.) Birhauser, Berlin. 2007. 9. Boyce, W.E. and R.C.DiPrima. Elementary Differential Equations and Boundary Value Problems. (7th Edn.) John Wiley and Sons, Inc., New York. 2001. 10. Sundrapandian, V. Ordinary and Partial Differential Equations, Tata McGraw Hill Education Pvt.Ltd. New Delhi, 2013
Website and e-Learning Source	<p>https://nptel.ac.in</p>

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Determine solutions of homogeneous equations, non-homogeneous equations of degree one in two variables, solve Bernoulli's equations and exact differential equations

CLO 2: Find the solutions of equations of first order but not of higher degree and to Determine particular integrals of algebraic, exponential, trigonometric functions and their products

CLO 3: Find solutions of simultaneous linear differential equations, linear equations of second order and to find solutions using the method of variations of parameters

CLO 4: Form a PDE by eliminating arbitrary constants and arbitrary functions, find complete, singular and general integrals, to solve Lagrange's equations

CLO 5: Explain standard forms and Solve Differential equations using Charpit's method

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	1	-	3	2	1
CLO2	3	1	3	2	1	-	3	2	1
CLO3	3	1	3	2	1	-	3	3	1
CLO4	3	1	3	2	2	1	3	3	1
CLO5	3	1	3	2	2	1	3	3	1

Title of the Course		MATHEMATICAL STATISTICS					
Paper Number		Discipline Specific Elective Course					
Category	Core	Year	II	Credits	3	Course Code	23U3MADE03
		Semester	III				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		3		1		--	4
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Knowledge about the methods of solving Sample spaces. • The understanding of how Probability Distributions can be used as a powerful tool in solving problems in Practical life.. 					
Course Outline		UNIT-I: Introduction- Combinatorial Methods- Binomial coefficients. (Chapter 1: Section-1.1, 1.2, 1.3.) (9 Hrs)					
		UNIT-II: Probability - Introduction-Sample spaces- Events –The Probability of event- Some Rules of Probability. (Chapter 2: Section-2.1, 2.2, 2.3, 2.4, 2.5.) (9 Hrs)					
		UNIT-III: Conditional Probability- Independent Events- Baye’s Theorem (Only problems). (Chapter 2: Section-2.6, 2.7, 2.8.) (9 Hrs)					
		UNIT-IV: Probability Distributions and Probability Densities- Introduction- Probability Distributions-Continuous Random variables- Probability Density functions-Multivariate Distributions. (Chapter 3: Section-3.1, 3.2, 3.3, 3.4, 3.5.) (9 Hrs)					
		UNIT-V: Marginal Distributions- Conditional Distributions- Mathematical Expectations- Introduction- The Expected value of a Random variable- Moments. (Chapter 3: Section-3.6, 3.7 and Chapter 4: Section- 4.1, 4.2, 4.3.) (9 Hrs)					

	TOTAL: 45 HRS
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication, Transferrable Skill and designing mathematical models towards solving mathematical applications
Recommended Text	1. Fruend John E, Mathematical Statistics, Prentice Hall of India, New Delhi.
Reference Books	1. Papoulis A. Probability, Random Variables and Stochastic process, Tata McGraw Hill Education Pvt. Ltd., New Delhi 2. Baisnab A., Jas M., Elements of Probability and Statistics, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 1993.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Define Combinatorial Methods and few examples

CLO 2: Define Sample spaces and The Probability of event

CLO 3: Describe Independent Events and problems

CLO 4: Define Probability Distributions, Continuous Random variables

CLO 5: Describe Conditional Distributions and Mathematical Expectations

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	2	2	3	3	2	2	3	1
CLO2	2	3	3	3	3	2	2	3	1
CLO3	3	3	3	3	3	2	2	3	1
CLO4	2	3	3	2	3	2	2	3	1
CLO5	2	3	3	3	3	2	2	3	1

Programme code	B.Sc	Programme Title	Bachelor of Science (Mathematics)	
Course Code	23U3MADEP1	Title	Batch	2023-2026
		MATHEMATICAL STATISTICS USING R PROGRAMMING	Semester	III
Hrs/Week	2		Credits	02

1. Find the Skewness and Kurtosis of a given data set distribution.
2. Applying Bayes' theorem to solve simple problems.
3. Find the mass function of a binomial distribution with $n=20$, $p = 0$.
also draw the graphs of mass function and cumulative distribution function.
4. Given the data $n = 50$, $\text{mean} = 25$, use appropriate function to find the mass function of a Poisson distribution. Also draw the graphs of the mass function and cumulative distribution function.
5. Using the normal distribution to calculate confidence intervals for the mean when the standard deviation is known.
6. Perform the Z test for difference in mean.
7. Conducting a hypothesis test for a sample mean with a known population variance.
8. Conducting a hypothesis test for the variance of a population using the chi-square distribution.
9. Conducting a hypothesis test for the difference between two variances using the F distribution.
10. Perform t – test for equality of mean.

TOTAL HRS: 30 HRS

Note:

1. Each experiment should have the Experiment No. and the title. The first section of each experiment is Aim, and then writes the Algorithm, then code and finally output of the program.
2. Use of Scientific Calculator and Statistical Tables are allowed in the Practical Exam

Title of the Course		INDUSTRIAL STATISTICS					
Paper Number		CORE 7					
Category	Core	Year	II	Credits	4	Course Code	23U4MAC07
		Semester	IV				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		4		1		--	5
Pre-requisite		12 th Standard Mathematics					
Objectives		To bridge the gap between industry academic interface – to apply the theory learn to industrial applications.					
Course Outline		Unit: I Random Variable – Discrete and Continuous – Distribution function – Marginal and Conditional Distributions – Mathematical Expectation – Moment Generating function – characteristic function – Chebychev’ s inequality. (12 HRS)					
		Unit: II Theoretical standard distributions – Binomial, Poisson and Normal Distributions – Derivations, properties and Applications – Simple problems. (12 HRS)					
		Unit: III Exact sampling distributions – Chi- Square distribution, ‘t’ distribution and ‘F’ distribution – Derivation of Mean, Variance, M.G.F and characteristic function – Relationship between ‘t’, Chi- Square and F distributions. (12 HRS)					

	<p>Unit: IV</p> <p>Correlation and Regression – Correlation co-efficient and rank correlation – Regression Lines and regression co-efficient – properties. (12 HRS)</p>
	<p>Unit: V</p> <p>Curve fitting – Method of Least Squares – Fitting of Second Degree Parabola – Fitting of power curve and Exponential curve - Simple problems. (12 HRS)</p>

TOTAL HRS	60 HRS
Extended Professional Component (isa part question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial hour)</p>
Skills acquired from this course	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
Recommended Text	<p>1.S.C.Gupta and V.K Kapoor., “Fundamentals of Mathematical Statistics”,Sultan Chand & Sons, (11th edition), Reprint 2019.</p>
Reference Books	<p>1. D.C Sancheti, and V.K Kapoor, “Statistics”, Sultan Chand and Sons, (7th edition),2005.</p> <p>2. S.P.Gupta, “Statistical Methods”, Sultan Chand and Sons, (44th edition), 2005.</p> <p>3. J.N. Kapur and H.C. Saxena, “Mathematical Statistics”, Sultan Chand and Sons, (20th edition), 2005</p>

Website and- Learning Source	<ol style="list-style-type: none"> 1. https://ocw.mit.edu. 2. http://www.stat.math.ethz.ch/~geer/mathstat.pdf 3. https://nptel.ac.in 4. https://swayam.gov.in
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	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	2	2	3	3	2	2	3	1
CLO2	2	3	3	3	3	2	2	3	1
CLO3	3	3	3	3	3	2	2	3	1
CLO4	2	3	3	2	3	2	2	3	1
CLO5	2	3	3	3	3	2	2	3	1

Title of the Course		ELEMENTS OF MATHEMATICAL ANALYSIS					
Paper Number		CORE M8					
Category	Core	Year	II	Credits	4	Course Code	23U4MAC08
		Semester	IV				
Instructional Hours per week		Lecture		Tutorial	Lab Practice	Total	
		4		1	--	5	
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> Identify and characterize sets and functions and Understand, test and analyze the convergence and divergence of sequences, series. Understand metric spaces with suitable examples 					
Course Outline		<p>UNIT-I: Sets and Functions: Sets and elements- Operations on sets- functions- real valued functions- equivalence- countability- real numbers- least upper bounds.</p> <p>(Chapter1: Section-1.1 to 1.7) (12 Hrs)</p> <p>UNIT-II: Sequences of Real Numbers: Definition of a sequence and subsequence-limit of a sequence – convergent sequences – divergent sequences- bounded sequences-monotone sequences</p> <p>(Chapter2: Section-2.1 to 2.6) (12 Hrs)</p> <p>UNIT-III: Operations on convergent sequences – operations on divergent sequences – limit superior and limit inferior-Cauchy sequences.</p> <p>(Chapter2: Section-2.7 to 2.10) (12 Hrs)</p>					

	<p>UNIT-IV: Series of Real Numbers: Convergence and divergence – series with non –negative terms-alternating series-conditional convergence and absolute convergence- tests for absolute convergence. (Chapter3: Section-3.1 to 3.4 and 3.6) (12 Hrs)</p>
	<p>UNIT-V: Limits and Metric Spaces: Limit of a function on the real line - Metric spaces - Limits in metric spaces – Continuous Functions on Metric Spaces: Function continuous at a point on the real line-Function continuous on a metric space.</p> <p>(Chapter4: Section-4.1 to 4.3 and Chapter5: 5.1 ,5.3) (12 Hrs)</p>
	TOTAL: 60 Hrs

<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial hour)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
<p>Recommended Text</p>	<p>1. Richard R. Goldberg, Methods of Real Analysis: Oxford and IBH Publishing, 2017.</p>
<p>Reference Books</p>	<p>1. Ethan D. Bloch, The Real Numbers and Real Analysis, Springer, 2011.</p> <p>2. G.M. The fundamentals of Mathematical Analysis, vol I. Pergamon Press, New York, 1965.</p>

	<p>3. T. M. Apostol, Calculus (Vol. I), John Wiley and Sons (Asia) P. Ltd., 2002.</p> <p>4. R.G. Bartle and D. R Sherbert, Introduction to Real Analysis, John Wiley and Sons (Asia) P. Ltd., 2000.</p> <p>5. E. Fischer, Intermediate Real Analysis, Springer Verlag, 1983.</p> <p>6. K.A. Ross, Elementary Analysis- The Theory of Calculus Series- Undergraduate Texts in Mathematics, Springer Verlag, 2003.</p>
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Explain in detail about sets and functions, equivalence and countability and the LUB axiom

CLO 2: Explain Sequence and Subsequence of real numbers and to find the limit of sequence to test for convergent, divergent, bounded and monotone sequences

CLO 3: Explain the operations on convergent and divergent sequences and to Explain the concepts of limit superior and limit inferior and the notion of Cauchy sequences

CLO 4: Classify the series of real numbers and the alternating series and their convergence and divergence, the conditional convergence and absolute convergence and solve problems on convergence of the sequences

CLO 5: Explain about the metric spaces and functions continuous on a Metric space

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	2	3	2	-	3	2	1
CLO2	3	3	2	3	2	-	3	2	1
CLO3	3	3	3	3	2	-	3	2	1
CLO4	3	3	3	3	2	-	3	2	1
CLO5	3	3	2	3	2	-	3	2	1

Title of the Course		TRANSFORMATION TECHNIQUES					
Paper Number		Discipline Specific Elective Course 4					
Category	Core	Year	II	Credits	3	Course Code	23U3MADE04
		Semester	IV				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		3		1		--	4
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • About Laplace Transforms and its inverse • To apply Laplace transform in solving Ordinary Differential Equations with constant coefficients, simultaneous Ordinary Differential Equations. • To solve problems in Fourier series and Fourier transforms. 					
Course Outline		<p>UNIT I: The Laplace Transforms_Definitions-Sufficient conditions for the existence of the Laplace transform(without proof)-Laplace transform of periodic functions-some general theorems-evaluation of integrals using Laplace transform-Problems.</p> <p style="text-align: center;">Chapter 5: Section-1 to 5. (9 Hrs)</p>					
		<p>UNIT II: The inverse Laplace Transforms- Applications of Laplace Transforms to ordinary differential equations with constant co- efficient and variable co-efficient, simultaneous equations and equations involving integrals-Problems.</p> <p style="text-align: center;">Chapter 5: Section-6 to 12. (9 Hrs)</p>					
		<p>UNIT III: Fourier series- Expansion of periodic functions of period 2π - Expansion of even and odd functions, Half range Fourier series- Change of intervals –Problems.</p> <p style="text-align: center;">Chapter 6: Section-1 to 6. (9 Hrs)</p>					

	<p>UNIT IV: Fourier Transform- Infinite Fourier Transform(Complex form) – Properties of Fourier Transform – Fourier cosine and Fourier sine Transform – Properties – Parseval’s identity – Convolution theorem - Problems.</p> <p>Chapter 6: Section-8 to 15. (9 Hrs)</p>
	<p>UNIT V: Z Transforms: Definition of Z-Transform and its properties - Z-Transforms of some basic functions- Examples and simple problems</p> <p>Chapter 7: Sections -7.1 to 7.3. (9 Hrs)</p>
	TOTAL: 45 Hrs

<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
<p>Recommended Text</p>	<p>1. “Calculus-Volume III” – S.Narayanan and T.K.Manicavachagam Pillai. (Ananda Book Depot)(for Units I toIV)</p> <p>2. “Engineering Mathematics for Semester III- Third Edition – T.Veerarajan (Tata McGraw-Hill Publishing CompanyLtd, New Delhi)</p> <p>(for Unit-V)</p>

ReferenceBooks	1. Engineering Mathematics Volume III – P.Kandasamy and others (S.Chand and Co.) 2. Advanced Engineering Mathematics- Stanley Grossman and William R.Devit. 3. Engineering Mathematics III-A.Singaravelu, Meenakshi Agency, Chenani,2008
Website ande-Learning Source	https://nptel.ac.in https://ocw.mit.edu . https://www.mathscard.co.uk

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	2	2	3	3	2	2	3	1
CLO2	2	3	3	3	3	2	2	3	1
CLO3	3	3	3	3	3	2	2	3	1
CLO4	2	3	3	2	3	2	2	3	1
CLO5	2	3	3	3	3	2	2	3	1

Programme code	B.Sc	Programme Title	Bachelor of Science (Mathematics)	
Course Code	23U4MAS03	Title	Batch	2023-2026
		SEC III: QUANTITATIVE APTITUDE	Semester	IV
Hrs/Week	2		Credits	02

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To remember and recollect the basic ideas about numbers.	K1, K2, K3
CO2	To understand the concept of Square root, Cube root and Average.	K1, K2
CO3	To gain the knowledge about trains and Ages.	K3, K4
CO4	To strengthen the ability to analyze Profit & Loss.	K4, K5
CO5	To gain the experience in Time.	K2, K3

Unit I **(6 Hours)**

Numbers, HCF&LCM of numbers, Decimal fractions

Unit II **(6 Hours)**

Simplification Square root, Cube root, Average

Unit III **(6 Hours)**

Problem on Numbers and Ages , Problems on Trains.

Unit IV **(6 Hours)**

Profit & Loss, Ratio & Proportion, Chain Rule, Boats & Streams

Unit V**(6 Hours)**

Time & Work, Pipes & Cistern, Time & Distance.

TOTAL :**30 Hours**

Power point Presentations, Seminar ,Quiz, Assignment

TEXT BOOK:**R.S.Aggarwal, “Quantitative Aptitude”, S. Chand & Co.Ltd., 2017.****REFERENCE BOOKS:**

- 1. R.S. Aggarwal, “A Modern Approach to Logical Reasoning”, S.Chand &Company Ltd., 2011.**
- 2. Sandip Jana, “Mathematics for competitive examinations”, Academic Publishers,2011.**
- 3. Kiran Prakasan, “Quantitative Aptitude for Competitive Examinations”, S.Chandand Company private Limited, 2008.**

ONLINE SOURCES :

- 1. <https://ocw.mit.edu>.**
- 2. <https://nptel.ac.in>**
- 3. <https://swayam.gov.in>**

Mapping with Programme Outcomes

PO															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO															
CO1	S	M	L	S	S	S	M	S	S	L	S	L	M	S	S
CO2	S	M	M	S	S	L	M	S	S	S	S	L	M	M	S
CO3	S	L	S	S	S	S	S	S	M	L	S	L	S	M	S
CO4	S	M	S	S	M	S	L	S	M	L	S	L	S	S	S
CO5	S	M	S	S	S	M	S	S	L	M	L	S	M	S	S

S - Strong; M - Medium; L – Low

Title of the Course		ABSTRACT ALGEBRA					
Paper Number		CORE M9					
Category	Core	Year	III	Credits	5	Course Code	23U5MAC09
		Semester	V				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Concepts of Sets, Groups and Rings. • Construction, characteristics and applications of the abstract algebraic structures 					
Course Outline		UNIT-I: Introduction to groups- Subgroups- cyclic groups and properties of cyclic groups- Lagrange's Theorem-A counting principle – Examples. (Chapter2: Section-2.1 to 2.5) (15 Hrs)					
		UNIT-II: Normal subgroups and Quotient group- Homomorphism- Automorphism -Examples. (Chapter2: Section-2.6 to 2.8) (15 Hrs)					
		UNIT-III: Cayley's Theorem-Permutation groups - Examples (Chapter2: Section-2.9 to 2.10) (15 Hrs)					
		UNIT-IV: Definition and examples of ring- Some special classes of rings- homomorphism of rings- Ideals and quotient rings- More ideals and quotient rings. (Chapter3: Section-3.1 to 3.5) (15 Hrs)					
		UNIT-V: The field of quotients of an integral domain-Euclidean Rings - The particular Euclidean Ring – Examples (Chapter3: Section-3.6 to 3.8) (15 Hrs)					
		TOTAL: 75 Hrs					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Text	Topics in Algebra–I.N.Herstein, Wiley Eastern Ltd. Second Edition, 2006.
Reference Books	<ol style="list-style-type: none"> 1. John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002. 2. M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011. 3. Joseph A Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa, 1999.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Explain groups, subgroups and cyclic groups

CLO 2: Explain about Normal subgroup, Quotient groups, Homomorphisms and Automorphisms and verify the functions for homomorphism and automorphism properties

CLO 3: Explain Permutation groups and apply Cayley's theorem to problems

CLO 4: Explain Rings, Ideals and Quotient Rings and examine their structure

CLO 5: Discuss about the field of quotient of an integral domain and to Explain in detail about Euclidean Rings

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	2	3	1	-	3	3	1
CLO2	3	3	2	3	1	-	3	3	1
CLO3	3	3	2	3	2	-	3	3	1
CLO4	3	3	2	3	1	-	3	3	1
CLO5	3	3	2	3	2	-	3	3	1

Title of the Course		REAL ANALYSIS					
Paper Number		CORE M10					
Category	Core	Year	III	Credits	5	Course Code	23U5MAC10
		Semester	V				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		5		1		--	6
Pre-requisite		12 th Standard Mathematics					
Objectives of		<ul style="list-style-type: none"> • Real Numbers and properties of Real-valued functions. • Connectedness, Compactness, Completeness of Metric spaces. • Convergence of sequences of functions, Examples and counter examples 					
Course Outline		<p>UNIT-I: Continuous Functions on Metric Spaces: Open sets– closed sets– Discontinuous function on \mathbb{R}^1. Connectedness, Completeness and Compactness: More about open sets-Connected sets.</p> <p>(Chapter5: Section-5.4 to 5.6 and Chapter6: Sections-6.1,6.2) (15 Hrs)</p>					
		<p>UNIT-II: Bounded sets and totally bounded sets: Complete metric spaces-compact metric spaces, continuous functions on compact metric space, continuity of inverse functions, uniform continuity.</p> <p>(Chapter6: Sections-6.3 to 6.8) (15 Hrs)</p>					
		<p>UNIT-III: Calculus: Sets of measure zero, definition of the Riemann integral, existence of the Riemann integral, properties of Riemann integral.</p> <p>(Chapter7: Sections-7.1 to 7.4) (15 Hrs)</p>					

	UNIT-IV: Derivatives- Rolle's theorem, The Law of mean, Fundamental theorems of calculus. (Chapter7: Sections-7.5 to 7.8) (15 Hrs)
	UNIT-V: Taylor's theorem-Point wise convergence of sequences of functions, uniform convergence of sequences of functions (Chapter8: Sections-8.5and Chapter9: Sections-9.1,9.2) (15 Hrs)
	TOTAL: 75 Hrs

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Methods of Real Analysis-Richard R.Goldberg (John Wiley & sons, 2 nd edition) (Indian edition –Oxford and IBH Publishing Co, New Delhi, 1 st January 2020)
Reference Books	1. Principles of Mathematical Analysis by Walter Rudin, Tata McGraw Hill Education, Third edition (1 July 2017). 2. Mathematical Analysis Tom M A postal, Narosa Publishing House, 2 nd edition (1974), Addison-Wesley publishing company, New Delhi.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Explain the concepts of Continuous and Discontinuous functions, open and close sets, Connectedness, Completeness and Compactness

CLO 2: Explain the concepts of bounded and totally bounded sets, continuity of inverse functions and Uniform continuity

CLO 3: Define the sets of measure zero, to Explain about the existence and properties of Riemann integral

CLO 4: Explain the concept of differentiability and to Explain Rolle's theorem, Law of mean, and Fundamental theorem of calculus

CLO 5: Explain the point wise and uniform convergence of sequence of function and to derive the Taylor's theorem

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	1	3	1	-	3	1	1
CLO2	3	3	1	3	1	-	3	1	1
CLO3	3	3	1	3	1	-	3	1	1
CLO4	3	3	1	3	1	-	3	1	1
CLO5	3	3	1	3	1	-	3	1	1

Title of the Course		MATHEMATICAL MODELLING					
Paper Number		CORE M11					
Category	Core	Year	III	Credits	4	Course Code	23U5MAC11
		Semester	V				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		4		1		--	5
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Construction and Analysis of Mathematical models found in real life problems. • Modelling through differential and difference equations 					
Course Outline		UNIT-I: Mathematical Modelling: Simple situations requiring mathematical modelling, characteristics of mathematical models. (Chapter1: Section-1.1, 1.4) (15 Hrs)					
		UNIT-II: Mathematical Modelling through differential equations: Linear Growth and Decay Models. Non-Linear growth and decay models, Compartment models. (Chapter2: Section-2.1 to 2.4) (15 Hrs)					
		UNIT-III: Mathematical Modelling, through system of Ordinary differential equations of first order: Prey-predator models, Competition models, Model with removal and model with immigrations. Epidemics: simple epidemic model, Susceptible-infected- susceptible (SIS) model, SIS model with constant number of carriers. Medicine: Model for Diabetes Mellitus. (Chapter3: Section-3.1: 3.1.1, 3.1.2; 3.2: 3.2.1to 3.2.4, 3.2.6, 3.5:3.5.1) (15 Hrs)					

	<p>UNIT – IV: Introduction to difference equations. (Chapter5: Section-5.1, 5.2: 5.2.1, 5.2.2, 5.2.3) (15 Hrs)</p>
	<p>UNIT-V: Mathematical Modelling through difference equations:Harrod Model, cob web model application to Actuarial Science (Chapter5: Section-5.3: 5.3.1, 5.3.2, 5.3.4) (15 Hrs)</p>
	<p>TOTAL: 75 Hrs</p>

<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)</p>
<p>Skills acquired from this course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
<p>Recommended Text</p>	<p>1. J N Kapur, Mathematical Modelling, New Age International publishers(2009).</p>
<p>Reference Books</p>	<p>1. Mathematical Modeling by Bimalk. Mishra and Dipak K.Satpathi. Ane Books Pvt. Ltd(1 January 2009)</p> <p>2. Mathematical Modeling Models, Analysis and Applications, by Sandip Banerjee, CRC Press, Taylor & Francis group, 2014</p> <p>3. Mathematical Modeling applications with Geogebra by Jonas Hall & Thomas Ligefjard, John Wiley & Sons, 2017</p> <p>4. Mark M. Meerschaert: Mathematical Modeling, Elsevier Publ., 2007.</p> <p>5. Edward A. Bender: An introduction to mathematical Modeling, CRC Press,2002</p>

	6. Walter J. Meyer, Concepts of Mathematical Modeling, Dover Publ., 2000
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Explain simple situations requiring Mathematical Modelling and to Determine the characteristics of such models

CLO 2: Model using differential equations in-terms of linear growth and Decay models

CLO 3: Model using systems of ordinary differential equations of first order, to discuss about various models under the categories ‘_Epidemics’ and ‘_Medicine’

CLO 4: Explain in detail about difference equations

CLO 5: Model using difference equations

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	2	3	3	3	2	2	2	3	2
CLO2	2	3	3	3	2	2	2	3	2
CLO3	2	3	3	3	2	2	2	3	2
CLO4	3	2	2	2	-	1	2	3	2
CLO5	2	3	3	3	2	2	2	3	2

SUBJECT TITLE	MATHEMATICAL METHODS USING C PROGRAMMING	DISCIPLINE SPECIFIC ELECTIVE COURSE	V
SUBJECT CODE	23U5MADE05	HOURS/WEEK	4
		TOTAL HOURS	45
SEMESTER	V	CREDIT	3

Course Outcomes (CO)

	CO Statement	Knowledge Level
CO1	To understand the concepts of C-program	K1, K2
CO2	To evaluate the special operators	K4, K5
CO3	To develop the concepts of expressions	K2, K3
CO4	To gain the knowledge about if..... else statements.	K3, K4
CO5	To analyze the concepts of arrays.	K3

Unit-I: (9 Hours)

Basic Structure of C Program – Character set – Constants – Keywords and identifiers – Variables – Data types – Declaration of variables – Assigning values to variables – Defining symbolic constants.

Unit-II: (9 Hours)

Arithmetic operators – Relational operators – Logical operators – Assignment operators – Increment and decrement operators – Conditional operators – Special operators.

Unit-III: (9 Hours)

Arithmetic expressions – Evaluation of expressions – Type conversions in expressions – Reading and Writing character – Formatted input and output.

Unit-IV: (9 Hours)

Decision making with if statement – The if... else statement – Nesting of if... else statement – The switch statement – The GOTO statement – The while statement – do while statement – for statement-Jumps in loops.

Unit-V:**(9 Hours)**

One dimensional arrays – Initialization of one dimensional array – Two dimensional array – Multi dimensional arrays – Declaring and Initializing string variables – Reading string from Terminal – Writing strings on the screen – Arithmetic operations on characters.

TOTAL HRS : 45 Hrs**TEXT BOOK:**

1. E.Balagurusamy, *“Programming In C”*, Tata McGraw-Hill Publishing Company Limited, Year.

REFERENCE BOOKS:

1. Greg Perry and Dean Miller, “C Programming”, Absolute Beginners, Third Edition, Year.
2. Byron Gottfried, “Programming With C”
3. Kernighan 78-B.W.Kernighan and D.M.Ritchie, the programming language,Practice-Hall: Englewood cliffs, NJ, 1978, 2nd Edition, 2005.
4. Kruse Robert L, *“Data Structure and Program Design in C”*
5. K.N.King, *“C Programming: A Modern Approach”*

ONLINE SOURCES:

- www.cppinstitute.org
- [www.freshto.com>c-basic-program](http://www.freshto.com/fresh.com/c-basic-program)
- [https://www.programiz.com>c-programming](https://www.programiz.com/c-programming)

Mapping with Programme Outcomes

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S	M	M	S	S	L	M	S	S	S	S	L	M	M	S
CO2	S	M	S	S	M	S	L	S	M	L	S	L	S	S	S
CO3	S	M	S	S	S	M	S	S	L	M	L	S	M	S	S
CO4	M	M	S	S	S	S	S	L	L	L	M	M	M	L	S
CO5	S	M	S	S	S	S	M	M	M	L	L	L	M	M	M

S – S- Strong; M - Medium; L – Low

SUBJECT TITLE	OPERATIONS RESEARCH-I	BATCH /MAJOR ELECTIVE COURSE	2023-2026/ VI
SUBJECT CODE	23U5MADE06	HOURS/WEEK TOTAL HOURS	5 45
SEMESTER	V	CREDIT	3

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To remember and recollect the basic ideas about LPP problems.	K1, K2, K3
CO2	To understand the Big M method, two phase simplex method.	K1, K2
CO3	To gain the knowledge about Optimal solution.	K3, K4
CO4	To strengthen the ability to analyze Assignment problem.	K4, K5
CO5	To gain the concepts of two machines.	K2, K3

UNIT –I: (9 Hours)

Introduction - Definition of O.R. – Scope of O.R. – Linear Programming Problem – Definitions – Mathematical Formulation – characteristic of LPP- Matrix form of LPP - Graphical Method – Definitions of bounded , unbounded and Optimal solutions – Procedure of solving LPP by graphical method – Problems- Simplex Technique- Definitions of basic, non-basic Variables – Basic solutions – Slack Variables and Optimal Solutions, Simplex Procedure of Solving LPP - Problems.

Chapter 1, Chapter 2

UNIT – II: (9 Hours)

Introduction- Big M method-definitions of Big M method-,surplus variables and Artificial variables- Procedure of solving an LPP by Big M method – Psuedo optimal solution – Problems - Two phase simplex method – Procedure of solving an LPP by Two phase simplex method – Problems. Chapter 3 (Sec 3.5)

UNIT - III:**(9 Hours)**

Duality in Linear Programming: Concept of duality – Formulation of Primal - Dual pairs – Duality Theorems – Complementary slackness theorem – Duality and simplex method – Dual simplex method – Dual simplex algorithm – Problems.

Chapter 4 (Sec 4.1 – 4.7)

UNIT- IV:**(9 Hours)**

Introduction-Balanced and Unbalanced T.P, Feasible solution – Basic Feasible solution – Optimum solution – Degeneracy in T.P – Mathematical Formulation – North West Corner rule – Vogel’s approximation Method (Unit penalty method) – Method of matrix minima (Least cost method) - Problems-Algorithm of optimality test (MODI Method) – Problems.

Assignment problem – Definition – Mathematical formulation of the Assignment problem – Test for optimality by using Hungarian method – Unbalanced Assignment problem- Degeneracy in Assignment problem – Variations in Assignment Problem – Problems.

Chapter 6, Chapter 7

UNIT –V:**(9 Hours)**

Introduction – Definition – Basic Assumption – n jobs to be operated on two machines – Problems – n jobs to be operated on three machines – Problems – n jobs to be operated on m machines – Problems – two jobs to be operated on m machines (Graphical method) – Problems .

Chapter 10

TOTAL: 45 HRS**TEXT BOOK:**

1. **P.K. Gupta, Man Mohan and Kanti Swarup, “Operations Research”,** Sultan Chand and Sons, New Delhi, Ninth Edition, 2015.

REFERENCE BOOKS:

1. **S.Kalavathy, “Operations Research”,** Second Edition, Vikas Publishing House, New Delhi, 2002.
2. **P.K.Gupta and D.S.Hira, “Operations Research”,** S.Chand & Co, New Delhi, Second Edition, 2004.
3. **Hamdy Taha, “Operations Research”,** Prentice Hall Publications, New Delhi, 1996.
4. **Nita Hshah Ravi M. Gor Hardiksoni, “Operations Research”,** PHI, P.Ltd., 2010.

ONLINE SOURCES :

1. www.analysiswebnotes.com
2. www.freebookcentre.net

Mapping with Programme Outcomes

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S	M	L	S	S	S	M	S	S	L	S	L	M	S	S
CO2	S	M	M	S	S	L	M	S	S	S	S	L	M	M	S
CO3	S	L	S	S	S	S	S	S	M	L	S	L	S	M	S
CO4	S	M	S	S	M	S	L	S	M	L	S	L	S	S	S
CO5	S	M	S	S	S	M	S	S	L	M	L	S	M	S	S

S - Strong; M - Medium; L – Low

SUBJECT TITLE	MATHEMATICAL METHODS USING C PROGRAMMING (PRACTICAL)	DISCIPLINE SPECIFIC ELECTIVE PRACTICAL	II
SUBJECT CODE	23U5MADEP2	HOURS/WEEK	2
		TOTAL HOURS	30
SEMESTER	V	CREDIT	2

Pre-requisite	Knowledge in C
PRACTICAL LIST	
<ol style="list-style-type: none"> 1. Write a C program to generate 'N' Fibonacci number. 2. Write a C program to print S all possible roots for a given quadratic equation. 3. Write a C program to calculate the statistical values of mean, median. 4. Write a C program to calculate the statistical values of Standard Deviation and variance of the given data . 5. Write a C program to sort a set of numbers. 6. Write a C program to sort the given set of names. 7. Write a C program to find factorial value of a given number 'N' using recursive function call. 8. Write a C program to find the product of two given matrix 	

Title of the Course		LINEAR ALGEBRA					
Paper Number		CORE M12					
Category	Core	Year	III	Credits	5	Course Code	23U6MAC12
		Semester	VI				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		4		1		--	5
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Vector Spaces, linear dependence and independence of vectors . Dualspaces, Inner product and norm – orthogonalization process. • Linear transformations. Various operators on vector spaces 					
Course Outline		UNIT-I: Vector spaces – Subspaces – Linear Combinations and linearspan - Systems of Linear equations – Homogenous Equations – Non- homogenous Equations – Elementary Matrices – Row reduced - Echelon form (Chapter1: Section-1.2 to 1.4; Chapter2: 2.7; Chapter3: 3.1) (15 HRS)					
		UNIT-II: Linear Dependence and Linear independence – Bases – Dimensions (Chapter1: Section-1.5, 1.6) (15 HRS)					
		UNIT-III: Linear transformations, null spaces and ranges – Matrixrepresentation of a linear transformation–invertibility and isomorphisms – dual spaces(Chapter2: Section-2.1,2.2,2.4, 2.6) (15 HRS)					
		UNIT – IV: Eigen values, eigen vectors, diagonalizability – invariant subspaces – Cayley–Hamilton theorem(Chapter5: Section-5.1,5.2, 5.4) (15 HRS)					
		UNIT-V: Inner products and norms – Gram Schmidt Orthogonalization Process - Orthogonal complements(Chapter6: Section-6.1,6.2) (15 HRS)					
		TOTAL: 75 HRS					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Linear Algebra - Stephen H Friedberg, Arnold J Insel and Lawrence E Spence, 5 th edition (2018) Pearson
Reference Books	<ol style="list-style-type: none"> 1. I.N.Herstein, Topics in Algebra, Wiley Eastern Ltd. Second Edition, 2006. 2. N.S.Gopalakrishnan, University Algebra, New Age International Publications, Wiley Eastern Ltd. 3. John B.Fraleigh, First course in Algebra, Addison Wesley. 4. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra, 4th Ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2004. 5. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007. 6. S. Lang, Introduction to Linear Algebra, 2nd Ed., Springer, 2005. 7. Gilbert Strang, Linear Algebra and its Applications, Thomson, 2007.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Acquire a detailed knowledge about vector spaces and subspaces

CLO 2: Explain the concepts of Linear Dependence, Linear Independence, Bases and Dimension of basis.

CLO 3: Explain the concept of Linear Transformations, their Matrix representation and the notion of dual spaces

CLO 4: Find the Eigen values and Eigen vectors, to apply the concepts for diagonalisation

CLO5: Explain about Inner product and norms and to apply Gram Schmidt Orthogonalization Process to problems on inner product spaces

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	2	3	-	-	3	3	1
CLO2	3	3	3	3	-	-	3	3	1
CLO3	3	3	2	3	1	-	3	3	1
CLO4	3	3	3	3	-	-	3	3	1
CLO5	3	3	3	3	1	-	3	3	1

Title of the Course		COMPLEX ANALYSIS					
Paper Number		CORE M13					
Category	Core	Year	III	Credits	5	Course Code	23U6MAC13
		Semester	VI				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		4		1		--	5
Pre-requisite		12th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Apply concept and consequences of analyticity and C-R equations. • Understand the concept of mappings and transformations. • Compute complex contour integrals and applying Cauchy's integral in various versions. • Understand zeros and singularities of an analytic function, apply their properties in the evaluation of definite integral. 					
Course Outline		<p>UNIT-I: Analytic functions: Functions of a Complex variable –Limits –Theorem on limits –Continuity – Derivatives – Differentiation formulas – Cauchy Riemann equation – conditions for differentiability</p> <p>– Polar coordinates– Analytic functions– Harmonic functions.</p> <p>(Chapter2: Section-11,14,15,17,18,19,20,21,22,23,25) (15 HRS)</p>					
		<p>UNIT-II: Conformal mapping: Mappings – Mapping by exponential function –Linear transformation – The transformation $w=1/z$</p> <p>Mappings by $w=1/z$ – Linear fractional transformations (bilinear)</p> <p>(Chapter2: Section-12,13;Chapter8: Section- 83 to 86) (15 HRS)</p>					

	<p>UNIT-III: Complex Integration: Contour integrals– Some examples – Simply and Multiply connected domains– Cauchy integral formula – Formula for derivatives– Liouville’s theorem –Fundamental theorem of Algebra– Maximum modulus principle.(Chapter4:39,40,46 to 50) (15 HRS)</p>
	<p>UNIT – IV: Sequences and Series: Convergence of sequences – Convergence of series– Taylor’s series – Laurent series– Absolute and uniform convergence of power Series – Continuity of sums of power series–Integration & differentiation of power series(Chapter5: Section- 51,52,53,55,57,58,59) (15 HRS)</p>
	<p>UNIT-V: Residues and Poles: Isolated singular points – Residues – Cauchy Residue theorem –Residue at infinity– The three types of isolated singular points – Residues at poles – Zeros of analytical functions – Zeros and poles – Evaluation of real improper integrals (excluding poles on the real axis). (Chapter6:Section- 62,63,65,66,68,69:Chapter7: Section-71) (15 HRS)</p>
TOTAL	75 HRS
Extended Professional Component (is apart of internal component only, Not to be included in the External Examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved</p> <p>(To be discussed during the Tutorial hour)</p>
Skills acquired from this course	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>

Recommended Text	1. Complex variables and application, Seventh Edition by James Ward Brown and Ruel V. Churchill, Mc-Graw Hill Book Co., International Edition, 2009.
Reference Books	<ol style="list-style-type: none"> 1. Theodore W. Gamelan, Complex Analysis, Springer Verlag, 2008 2. Joseph Bak and Donald J. Newman, Complex analysis, 2nd Ed., Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., New York, 1997. 3. Richard A. Silverman, Introductory Complex Analysis. Dover Publications, 1972. 4. S. Ponnusamy and H. Silverman, Complex variables with applications, Birkhauser, 2006.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

CLO 1: Explain about analytic functions, their differentiation and continuity and to verify the Harmonic functions using analyticity conditions

CLO 2: Explain the concept of Conformal mappings and mappings by linear transformations and linear fractional transformations

CLO 3: Explain about the integrations of functions over simply and multiply connected domains and to derive the Cauchy integral formula, Liouville's theorem, Fundamental theorem of Algebra and Maximum Module Principle

CLO 4: Find the convergence the sequences and series, to derive Taylor's and Laurent's series

CLO 5: Find the nature of singularities, to find the residue of a given function at a given singular point, to Explain about zeros and poles and to evaluate real improper integrals (Excluding poles on the real axis)

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	3	3	2	1	-	3	3	2
CLO2	3	3	3	2	1	-	3	3	2
CLO3	3	3	3	2	1	-	3	3	2
CLO4	3	3	3	2	1	-	3	3	2
CLO5	3	3	3	2	1	-	3	3	2

Title of the Course		MECHANICS					
Paper Number		CORE M14					
Category	Core	Year	III	Credits	4	Course Code	23U6MAC14
		Semester	VI				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		4		1		--	5
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • Equilibrium of a particle under the action of given forces • Simple Harmonic Motion • Projectiles 					
Course Outline		<p>UNIT-I: Force: Newton's laws of motion – Resultant of two forces on a particle - Equilibrium of a Particle: Equilibrium of a particle – Limiting equilibrium of a particle on an inclined plane.</p> <p>(Chapter2: Section-2.1,2.2; Chapter3: Section-3.1,3.2) (12 HRS)</p>					
		<p>UNIT-II: Forces on a Rigid Body: Moment of a Force – General motion of a body – Equivalent systems of forces- Parallel Forces – Forces acting along a Triangle - A specific reduction of Forces: Reduction of coplanar forces into a force and couple – Problems involving frictional forces.</p> <p>(Chapter4: Section-4.1 to 4.5; Chapter5: Sections-5.1,5.2) (12 HRS)</p>					
		<p>UNIT-III: Work, Energy and Power: Work – Conservative field of force – Power -Rectilinear Motion under Varying Force: Simple Harmonic Motion - along a horizontal line – along a vertical line.</p> <p>(Chapter11:Section-11.1,11.2,11.3;Chapter12: Section-12.1,12.2,12.3) (12 HRS)</p>					

	UNIT – IV: Projectiles: Forces on a projectile – Projectile projected on an inclined plane (Chapter13: Section-13.1, 13.2) (12 HRS)
	UNIT-V: Central Orbits: General orbits – Central orbit – Conic as a centered orbit. (Chapter16: Section-16.1 to 16.3) (12 HRS)
	TOTAL: 60HRS

Extended Professional Component (is apart of internal component only,Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Duraipandian. P.,Laxmi Duraipandian and Muthamizh Jayapragasm-Mechanics. 2007. S.Chand and company.

Reference Books	<ol style="list-style-type: none"> 1. A. Ruina and R. Pratap, Introduction to Statics and Dynamics, , Oxford University Press, 2014. 2. S.L. Loney, The Elements of Statics and Dynamics, Cambridge University Press, 1904.J.L. Meriam and L. G. Kraige, Engineering Mechanics: Statics, Seventh Edition,Wiley and sons Pvt ltd., New York, 2012. 3. J.L. Meriam, L. G. Kraige, and J.N. Bolton, Engineering Mechanics: Dynamics, 8thedn, Wiley and sons Pvt ltd., New York,2015. 4. A. K. Dhiman,P.Dhinam and D. Kulshreshtha, Engineering Mechanics (Statics and Dynamics) ,McGraw Hill Education(India) Private Limited, New Delhi, 2015.
Website and e-Learning Source	https://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will able to

CLO 1: Define Resultant, Component of a Force, Coplanar forces, like and unlike parallel forces, Equilibrium of a Particle, Limiting equilibrium of a particle on an inclined plane.

CLO 2: Define Moment of a force and Couple with examples. Define Parallel Forces and Forces acting along a Triangle, Solve problems on frictional forces

CLO 3: Define work, energy, power, rectilinear motions under varying forces. Define Simple Harmonic Motion and find its Geometrical representation.

CLO 4: Define Projectile, impulse, impact and laws of impact. Prove that the path of a projectile is a parabola. Find the direct and oblique impact of smooth elastic spheres

CLO 5: Define central orbits, explain conic as centered orbits and solve problems related to central orbits

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	2	3	2	1	1	3	3	2
CLO2	3	2	3	2	1	1	3	3	2
CLO3	3	2	3	2	1	1	3	3	2
CLO4	3	2	3	2	1	1	3	3	2
CLO5	3	2	3	2	1	1	3	3	2

Title of the Course		GRAPH THEORY WITH APPLICATIONS					
Paper Number		DISCIPLINE SPECIFIC ELECTIVE COURSE					
Category	EC(Discipline-centric)	Year	III	Credits	3	Course Code	23U6MADE07
		Semester	VI				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		4		1		--	5
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • To introduce the concepts of Graphs. • To provide a sound knowledge on Trees and Spanning Trees • To gain knowledge about Matrices of Graphs and Digraphs. 					
Course Outline		Unit I : Introduction, Paths and Circuits: Introduction- Finite and Infinite graphs-Applications of Graphs- Incidence and degree-Isolated vertex, Pendent vertex and Null graph- Isomorphism- Subgraphs -Walks, Paths and circuits-Connected Graphs-Disconnected Graphs and Components. (Chapter1: Sections 1.1 to 1.5 & Chapter2: Sections 2.1,2.2, 2.4&2.5) (9 HRS)					
		Unit II: Paths and Circuits: Euler graphs- Operations on Graphs-More on Euler graphs-Hamiltonian Paths and Circuits Trees and Fundamental Circuits: Trees-Some properties on Trees-Pendent vertices in a Tree-Distance and Canters in a Tree- Spanning Trees. (Chapter2: Sections 2.6 to 2.9 & Chapter3: Sections 3.1 to 3.4, 3.7) (9 HRS)					

	<p>Unit III:</p> <p>Matrix Representation of Graphs:</p> <p>Incidence Matrix- Submatrices of A(G)-Circuit Matrix-Fundamental Circuit Matrix and Rank of B- Path Matrix-Adjacency Matrix. (Chapter7: Sections 7.1 to 7.9) (9 HRS)</p> <hr/> <p>Unit IV:</p> <p>Colouring, Covering and Partitioning:</p> <p>Chromatic Number-Chromatic Partitioning-Chromatic Polynomial-Matchings –Coverings.</p> <p>(Chapter8: Sections 8.1 to 8.5) (9 HRS)</p> <hr/> <p>Unit V:</p> <p>Directed Graphs:</p> <p>Definition-Some types of Digraphs-Directed Paths and Connectedness-Euler Digraphs-Trees with Directed Edges.</p> <p>(Chapter9: Sections 9.1, 9.4 to 9.6) (9 HRS)</p>
TOTAL	45 HRS
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved
Skills acquired from this course	Knowledge, problem solving, analytical ability, and professional competency.
Recommended Text	S.Arumugam, S.Ramachandran, “Invitation To Graph Theory”, Scitech Publications, Chennai,2001.

Reference Books	<p>1.Narasingh Deo, “ <i>Graph Theory with applications to Engineering and ComputerScience</i>”, Prentice Hall of India Pvt.Ltd, 2002.</p> <p>2.Frank Harary, “ <i>Graph Theory</i>”, Narosa Publishing House, Tenth reprint, 2001.</p> <p>3.Douglas B.West, “<i>Introduction to Graph Theory</i>”, Prentice Hall of India (pvt.) limited,Second edition, 2011.</p> <p>4.Gary chartrand, Ping zhang, “<i>Introduction to Graph theory</i>”, Mc Graw Hill Education, 2006.</p>
Website and e-Learning Source	<p>https://nptel.ac.in</p>

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Understand the concepts of Graph, Sub graph , Walks and Paths.

CLO 2: Discuss about Eulerian graphs, Hamiltonian Paths and Trees.

CLO 3: Give Matrix Representations of Graphs

CLO 4: Know about Chromatic number and Chromatic Polynomial

CLO 5: Describe about digraph, Euler digraphs.

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	2	3	2	2	1	3	3	2
CLO2	3	2	3	2	2	1	3	3	2
CLO3	3	2	3	2	2	1	3	3	2
CLO4	3	2	3	2	2	1	3	3	2
CLO5	3	2	3	2	2	1	3	3	2

SUBJECT TITLE	OPERATIONS RESEARCH-II	DISCIPLINE SPECIFIC ELECTIVE COURSE	VIII
SUBJECT CODE	23U6MADE08	HOURS/WEEK	5
		TOTAL HOURS	45
SEMESTER	VI	CREDIT	3

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To remember and recollect the concepts of inventory models.	K1, K2, K3
CO2	To understand discrete and continuous type problem	K1, K2
CO3	To gain the knowledge about queuing models	K3, K4
CO4	To analyze PERT and CPM networks.	K4, K5
CO5	To gain the concepts of time cost optimization algorithm	K2, K3

UNIT- I:

(9 Hours)

Introduction - Definition of Inventory models-Type of Inventory models : (i) Uniform Rate of Demand, Infinite Rate of production and No shortages. (ii) Uniform Rate of Demand, Finite Rate of production and No shortages. (iii) Uniform Rate of Demand instantaneous production with shortage-Book Works-Problems.

Definitions-News Paper Boy Problem-Discrete and Continuous type cases-Problems- Inventory Model with one and two price break-Problems. Chapter: 18

Unit - II:

(9 Hours)

Games and Strategies: Introduction – Two – Person Zero – Sum games – The Maximin – Minimax Principle – Games Without saddle points – Mixed Strategies – Solution of 2 X 2 Rectangular games – Graphical method – Problems.

Chapter 9: (Sec 9.1 – 9.6)

Unit - III :**(9 Hours)**

Introduction - Definition of steady state, transient state and queue discipline, characteristics of a queuing model – Applications of queuing model – Little’s formula – classification of queues – Poisson process – Properties of Poisson process. Models

(i) (M / M / I) : (/ FCFS)

(ii) (M / M / I) : (N / FCFS)

(iii) (M / M / S) : (/ FCFS) – Problems. Chapter 17

Unit - IV:**(9 Hours)**

Introduction – Definition of network, event, activity, optimistic time, pessimistic time, the most likely time, critical path, total float and free float – Difference between Slack and Float- Phases of Critical Path in a PERT Network – difference between CPM and PERT – Problems.

Chapter 21

Unit - V:**(9 Hours)**

Replacement Problems and System Reliability: Introduction – Replacement of Equipment or Asset that Deteriorates gradually – Replacement of equipment that fails suddenly – Recruitment and promotion problem – Equipment renewable problem – Reliability and system failure rates – Problems.

Chapter 19: (Sec 19.1 – 19.6)

TOTAL: 45 HRS**TEXT BOOK:**

1.P.K. Gupta, Man Mohan and Kanti Swarup, “Operations Research”, Sultan Chand and Sons, New Delhi, Ninth Edition, 2015.

REFERENCE BOOKS:

1.S.Kalavathy, “Operations Research”, Second Edition, Vikas Publishing House, New Delhi, 2002.

2.P.K.Gupta and D.S.Hira, “Operations Research”, S.Chand & Co, New Delhi, Second Edition, 2004.

3. Hamdy Taha, “*Operations Research*”, Prentice Hall Publications, New Delhi, 1996.

4. Nita Hshah Ravi M. Gor Hardiksoni, “*Operations Research*”, PHI, P.Ltd., 2010.

ONLINE SOURCES :

1. www.analysiswebnotes.com

2. www.freebookcentre.net

Mapping with Programme Outcomes

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
	CO1	S	M	L	S	S	L	S	S	S	M	S	L	S	M
CO2	S	L	S	S	S	M	L	S	M	M	L	L	L	L	M
CO3	S	M	S	S	S	M	M	S	M	L	L	L	M	M	S
CO4	S	M	S	S	S	M	L	M	L	L	M	L	L	L	S
CO5	S	M	S	S	S	M	M	S	M	L	L	L	M	M	S

S - Strong; M - Medium; L – Low

DISCIPLINE SPECIFIC ELECTIVE COURSES:

SUBJECT TITLE	COMBINATORICS	BATCH /MAJOR ELECTIVE COURSE	2023-2026
SUBJECT CODE	23U2MADE09	HOURS/WEEK TOTAL HOURS	4 45
SEMESTER	II	CREDIT	3

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To recollect the basic concept of Recurrence Relation	K1, K2
CO2	To understand the concept of Permutation	K3, K4
CO3	To gain knowledge about Gala's optimal assignment problem.	K1, K3
CO4	To understand the Fibonacci type relation	K4, K2
CO5	To analyze the concepts of The inclusion and Exclusion principle	K2, K5

Unit I (9 Hours)

Introduction to Basic ideas – General formula for $f(n,k)$ – Recurrence Relation – boundarycondition – Fibonacci sequence - generating function.

Unit II (9 Hours)

Permutation – Ordered selection – unordered selection – further remarks on Binomial theorem.

Unit III (9 Hours)

Passing within a set - Pairing between set and optimal assignment problem – Gala's optimal assignment problem.

Unit IV**(9 Hours)**

Fibonacci type relation – using generating function - Miscellaneous method –
Counting simple electrical networks.

Unit V**(9 Hours)**

The inclusion – Exclusion principle – Rook polynomial.

TEXT BOOK:

1. Jan Anderson, **A First Course in Combinatorial Mathematics**, Oxford Applied Mathematics and Computing Science Series, UK, 1974.

REFERENCE BOOKS:

1. V.K. Balakrishnan, **Combinatorics**, Schaum Series, 1996
2. Marshall Hall Jr, **Combinatorial theory**, John Wiley & Sons, 2nd edition.

ONLINE SOURCES:

1. <https://nptel.ac.in>
2. <https://swamyam.gov.in>

Mapping with Programme Outcomes

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S	M	M	S	S	M	L	M	L	L	M	L	L	M	S
CO2	S	M	L	S	S	L	S	S	S	M	S	L	S	M	S
CO3	S	L	S	S	S	M	L	S	M	M	L	L	L	L	M
CO4	S	M	S	S	S	M	M	S	M	L	L	L	M	M	S
CO5	S	M	S	S	S	M	L	M	L	L	M	L	L	L	S

S - Strong; M - Medium; L - Low

Title of the Course		DIFFERENCE EQUATIONS WITH APPLICATIONS					
Paper Number		ELECTIVE COURSE					
Category	Core	Year	III	Credits	3	Course Code	23U5MADE10
		Semester	V				
Instructional Hours per week		Lecture		Tutorial		Lab Practice	Total
		4		1		--	5
Pre-requisite		12 th Standard Mathematics					
Objectives of the Course		<ul style="list-style-type: none"> • It is the study of difference operator and its application. • Solving first order difference equations. • Solving Difference equations using matrix form. 					
Course Outline		<p>UNIT-I:</p> <p>Difference operator - Summation – Generating functions and approximate summation. (Chapter 2: Sections 2.1 to 2.3) (9 Hrs)</p> <hr/> <p>UNIT-II:</p> <p>First order equations - General results for linear equations - Solving linear equations. (Chapter 3: Sections 3.1 to 3.3) (9 Hrs)</p> <hr/> <p>UNIT-III:</p> <p>Equations with variable coefficients – The z - transform. (Chapter 3: Sections 3.5 to 3.7) (9 Hrs)</p> <hr/> <p>UNIT-IV: Initial value problems for linear systems – Stability of linear systems. (Chapter 4: Sections 4.1, 4.2) (9 Hrs)</p> <hr/> <p>UNIT-V: Phase plane Analysis for Linear Systems, Fundamental Matrices and Floquet Theory. (Chapter 4: Sections 4.3, 4.4) (9 Hrs)</p> <hr/> <p>TOTAL: 45 Hrs</p>					

Skills acquired from this course	Knowledge, problem solving, analytical ability, and professional competency.
Recommended Text	1. W.G. Kelley and A.C. Peterson, "Difference Equations", 2nd Edition, Academic Press, New York, 2001.
Reference Books	1. 1. R.P. Agarwal, "Difference Equations and Inequalities", 2nd Edition, Marcel Dekker, New York, 2000. 2. S.N. Elaydi, "An Introduction to Difference Equations", 3rd Edition, Springer, India, 2008. 3. R. E. Mickens, "Difference Equations", 3rd Edition, CRC Press, 2015.
Website and e-Learning Source	https://nptel.ac.in

Mapping with Programme Outcomes

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO															
CO1	S	M	L	S	S	L	S	S	S	M	S	L	S	M	S
CO2	S	L	S	S	S	M	L	S	M	M	L	L	L	L	M
CO3	S	M	S	S	S	M	M	S	M	L	L	L	M	M	S
CO4	S	M	S	S	S	M	L	M	L	L	M	L	L	L	S
CO5	S	M	S	S	S	M	M	S	M	L	L	L	M	M	S

SUBJECT TITLE	NUMBER THEORY	BATCH/ MAJOR ELECTIVE COURSE	2023-2026
SUBJECT CODE	23U6MADE11	HOURS/WEEK	6
SEMESTER	VI	TOTAL HOURS	45
		CREDIT	3

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To gain knowledge about division algorithm	K1, K2
CO2	To analyze the basic properties of congruence	K1, K2, K3
CO3	To understand the concepts of divisible theorem.	K1, K2
CO4	To forming greatest integer problem.	K3, K4
CO5	To solve the problem of Euler's theorem	K4, K5, K6

Unit I **(9 Hours)**

The Division Algorithm – The g.c.d – The Euclidean Algorithm – The Diophantine Equation $ax+by = c$.

Unit II **(9 Hours)**

The Fundamental theorem of arithmetic, The sieve of Eratosthenes – The Goldbach conjecture – basic properties of congruence.

Unit III **(9 Hours)**

Special Divisibility tests – Linear congruences – The Little Fermat's theorem – Wilson's theorem.

Unit IV **(9 Hours)**

The functions μ and σ – The Mobius inversion formula – The greatest integer function.

Unit V **(9 Hours)**

Euler's Phi – function – Euler's theorem – Some properties of the Phi – function.

TEXT BOOK:

1. David M. Burton, “*Elementary Number Theory*”, Universal Book Stall, 2010.

REFERENCE BOOKS:

1. K. Ireland and M. Rosen, *A Classical Introduction to Modern Number Theory*, Springer Verlag, New York, 1972.
2. T.M. Apostol, *Introduction to Analytic Number Theory*, Narosa Publication, House, Chennai, 1980.
3. *Elementary Number Theory*, Seventh Edition, MC Graw-Hill Companies, 2015.
4. Ivan Niven and H.S. Zuckerman, *An Introduction to the Theory of Numbers*, 3rd edition, Wiley Eastern Ltd, New Delhi, 1989.

ONLINE SOURCES:

1. www.wiley.com/go/permissions
2. www.freebookcentre.net
3. <http://nptl.ac.in>

Mapping with Programme Outcomes

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
											1	2	3	4	5
CO1	S	M	S	S	S	S	L	M	L	L	S	M	M	M	S
CO2	S	M	S	S	S	M	L	M	L	L	M	L	L	L	S
CO3	S	M	L	S	S	M	M	M	M	L	S	M	M	M	S
CO4	S	M	L	S	S	M	M	M	M	L	S	M	L	L	S
CO5	M	M	S	S	S	S	M	L	L	L	S	M	S	S	S

S - Strong; M - Medium; L – Low

SUBJECT TITLE	FINANCIAL MATHEMATICS	BATCH /MAJOR ELECTIVE COURSE	2023-2026
SUBJECT CODE	23U6MADE12	HOURS/WEEK	6
		TOTAL HOURS	45
SEMESTER	V	CREDIT	3

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	To understand the concepts of probabilities	K1, K2
CO2	To evaluate the G. B. M method	K4, K5
CO3	To develop the concepts of Arbitrage theorem.	K2, K3
CO4	To gain the knowledge about divided paying securities.	K3, K4
CO5	To impart the investments by expected utility.	K3

Unit I

(9 Hours)

Probability – Probabilities and Events – Conditional probability – Random Variables and Expected Values – Covariance and correlation – Continuous Random variables - Normal Random Variables – Properties of Normal Random Variables – The central limit Theorem – Simple Problems.

Chapter : 1, Chapter : 2

Unit II

(9 Hours)

Geometric Brownian Motion – G.B.M. as a limit of simple models – Brownian Motion – Simple problems -Interest rates – Present value analysis – Rate of returns – Continuously varying interest rates – An example of option pricing – other examples of pricing via arbitrage.

Chapter: 3 (Section 3.3), Chapter: 4, Chapter: 5

Unit III**(9 Hours)**

The Arbitrage theorem – The multi period Binomial model – Proof of the Arbitrage theorem – The Black Scholes formula – Properties of the Black schools option cost – Derivation of Black Scholes formula – simple problems.

Chapter : 6, Chapter: 7 (Sections: 7.1, 7.2, 7.3. 7.5.1)

Unit IV**(9 Hours)**

Additional results on options – Call option on Divided paying Securities – Pricing American put options – Adding Jumps to Geometric Brownian Motion – Estimating the Volatility Parameter – simple problems.

Chapter :8 (Sections: 8.1 to 8.5)

Unit V**(9 Hours)**

Valuing by Expected Utility – Limitation of Arbitrage pricing – valuing Investments by Expected utility – The portfolio selection problem – Value at risk and conditional value at risk - The Capital assets pricing model – Mean variance analysis of risk- Neutral priced Call options – Rates of return – Single period and Geometric Brownian Motion – simple problems.

Chapter : 9

TEXT BOOK:

1. **Sheldon M.Ross, An Elementary Introduction to Mathematical Finance**, 2nd Edition, Cambridge University Press, 2005.

REFERENCE BOOKS:

1. **McCutcheon, John.J; Scott, William F. London: Heinemann , “An Introduction to the Mathematics of Finance”, 1986.**
2. **Ingersoll, Jonathan E. Rowman & Littlefield, “Theory of Financial decision making”, 1987.**

ONLINE SOURCES:

1. <http://www.stat.math.ethz.ch/~geer/mathstat.pdf>
2. <https://nptel.ac.in>
3. <https://swayam.gov.in>

Mapping with Programme Outcomes

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S	M	M	S	S	L	M	S	S	S	S	L	M	M	S
CO2	S	M	S	S	M	S	L	S	M	L	S	L	S	S	S
CO3	S	M	S	S	S	M	S	S	L	M	L	S	M	S	S
CO4	M	M	S	S	S	S	S	L	L	L	M	M	M	L	S
CO5	S	M	S	S	S	S	M	M	M	L	L	L	M	M	M

S - Strong; M - Medium; L – Low

SUBJECT TITLE	ASTRONOMY	DISCIPLINE SPECIFIC ELECTIVE COURSE	XIII
SUBJECT CODE	23U6MADE13	HOURS/WEEK TOTAL HOURS	5 45
SEMESTER	VI	CREDIT	3

COURSE OBJECTIVES:

- To introduce the exciting world of astronomy to the students.
- To help the students to study spherical trigonometry in the field of astronomy.
- To understand the movements of the celestial objects.

UNIT – I:

Relevant properties of sphere and formulae in spherical trigonometry (no proof, no problems) -
Celestial sphere and diurnal motion -Celestial coordinates-sidereal time. **(9 HRS)**

UNIT – II:

Morning and evening stars -circumpolar stars- diagram of the celestial sphere -zones of earth -
perpetual day-dip of horizon-twilight. **(9 HRS)**

UNIT – III:

Refraction - laws of refraction -tangent formula-Cassini's formula - horizontal
refractiongeocentric parallax -horizontal parallax. **(9 HRS)**

UNIT – IV:

Kepler's laws - verification of 1st and 2nd laws in the case of earth - Anomalies -Kepler's
equation - Seasons -causes -kinds of years. **(9 HRS)**

UNIT – V:

Moon-sidereal and synodic months - elongation - phase of moon - eclipses-umbra and penumbra
- lunar and solar eclipses - ecliptic limits - maximum and minimum number of eclipses near a node
and in a year - Saros. **(9 HRS)**

REFERENCES:

1. Kumaravel, S. and Susheela Kumaravel, Astronomy, 8th Edition, SKV Publications, 2004.
 - UNIT – I : Sections 39-79
 - UNIT – II : Sections 80-90,106-116
 - UNIT – III : Sections 117-144
 - UNIT – IV : Sections 146-162,173-178
 - UNIT – V : Sections 229-241,256-275
2. G V Ramachandran, Text Book of Astronomy, Mission Press, Palayamkottai, 1965.

COURSE OUTCOMES:

After completing this course, the students will be able to

- acquire basic knowledge about morning, evening stars, circumpolar stars.
- Solve the problems with scientific reasoning and critical thinking skills.
- Prepare calendar and conservation of time.

Mapping with Programme Outcomes

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO															
CO1	S	M	L	S	S	L	S	S	S	M	S	L	S	M	S
CO2	S	L	S	S	S	M	L	S	M	M	L	L	L	L	M
CO3	S	M	S	S	S	M	M	S	M	L	L	L	M	M	S
CO4	S	M	S	S	S	M	L	M	L	L	M	L	L	L	S
CO5	S	M	S	S	S	M	M	S	M	L	L	L	M	M	S

NON MAJOR ELECTIVE COURSES:

Programme code	FOR ALL UG	Programme Title		
Course Code	21U3MAN01	Title	Batch	2021-24
		NMEC –I	Semester	III
Hrs/Week	2	QUANTITATIVE APTITUDE FOR ALL	Credits	2

Course Outcomes(CO)

CO Number	CO Statement	Knowledge Level
CO1	To gain the knowledge about HCF and LCM of Numbers.	K1,K2
CO2	To understand the concept of Simplification, Ratio and Proportion	K1,K2,K3
CO3	To apply the concept of Problems on Ages and Problems on numbers.	K3,K4,K5
CO4	To strengthen the ability to analyze Percentage, Profit and Loss	K4
CO5	To determine new techniques of Time and work, Time and Distance	K2,K3

UNIT-I: (6 hours)

HCF and LCM of Numbers.

UNIT-II: (6 hours)

Simplification, Ratio and Proportion

UNIT-III: (6 hours)

Problems on numbers, Problems on Ages,

UNIT-IV: (6 hours)

Percentage, Profit and Loss

UNIT-V: (6 hours)

Time and work, Time and Distance.

TOTAL : 30 Hours

Power point Presentations, Seminar ,Quiz, Assignment
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TEXT BOOK:

R.S. Agarwal, “Quantitative Aptitude”, S.Chand & Company Ltd., New Delhi, Reprint 2011.

REFERENCE BOOKS:

1. **R.S. Aggarwal, “A Modern Approach to Logical Reasoning”, S.Chand & Company Ltd., New Delhi, 2011.**
2. **Sandip Jana, “Mathematics for competitive examinations”, Academic Publishers, 2011.**
3. **Kiran Prakasan, “Quantitative Aptitude for Competitive Examinations”, S.Chand and Company private Limited, New delhi, 2008.**

ONLINE SOURCES:

1. www.themathpage.com
2. <https://swayam.gov.in>
3. www.brightstorm.com
4. <https://ocw.mit.edu>
5. <https://nptel.ac.in>

MappingwithProgrammeOutcomes

PO															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO															
CO1	S	M	S	S	S	S	L	M	M	M	M	M	M	M	S
CO2	S	M	S	M	S	M	L	M	L	L	M	L	L	L	S
CO3	M	M	L	M	L	M	M	M	M	L	S	L	M	M	S
CO4	S	M	L	S	L	M	M	M	M	L	S	L	L	L	S
CO5	M	M	S	S	S	S	M	L	L	L	S	S	S	S	S

S-Strong;M-Medium;L-Low

Programme code	FOR ALL UG	Programme Title		
Course Code	21U3MAN02	Title	Batch	2021-24
		NMEC –I	Semester	III
Hrs/Week	2	LINEAR PROGRAMMING	Credits	2

Course Outcomes(CO)

CO Number	CO Statement	Knowledge Level
CO1	To remember and recollect the basic ideas about LPP problems.	K1,K2,K4
CO2	To understand the graphical method	K1,K2
CO3	To gain the knowledge about Simplex Method.	K3
CO4	To strengthen the ability to analyze Balanced Transportation Problem.	K4,K5,K3
CO5	To gain the concepts of Assignment problem.	K2,K3

UNIT-I: (6 hours)

Introduction - Definition of O.R. – Scope of O.R. – Linear Programming Problem – Definitions – Mathematical Formulation – characteristic of LPP.

UNIT-II: (6 hours)

Matrix form of LPP - Graphical Method – Definitions of bounded - Optimal solutions– Procedure of solving LPP by graphical method–Problems.

UNIT-III: (6 hours)

Simplex Technique-Definitions of basic, non-basic Variables – Basic solutions–Slack Variables and Optimal Solutions, Simplex Procedure of Solving LPP - Problems.

UNIT-IV: (6 hours)

Introduction-Balanced T.P, Feasible solution–Basic Feasible solution–Optimum solution – Degeneracy in T.P – Mathematical Formulation – North West Corner rule –Method of matrix minima (Least cost method) – Problems.

UNIT-V: (6 hours)

Assignment problem – Definition – Mathematical formulation of the Assignment problem – Test for optimality by using Hungarian method– Balanced Assignment problem–Variations in Assignment Problem–Problems.

TEXT BOOK:

1. S. Kalavathy, “*Operations Research*”, Second Edition, Vikas Publishing House, New Delhi, 2002.

REFERENCEBOOKS:

5. P.K.Gupta, ManMohanandKantiSwarup, “*Operations Research*”, SultanChandandSons, New Delhi, Ninth Edition, 2015.
6. P.K.Gupta and D.S.Hira, “*Operations Research*”, S.Chand & Co, New Delhi, Second Edition, 2004.
7. Hamdy Taha, “*Operations Research*”, Prentice Hall Publications, New Delhi, 1996.
8. Nita H Shah Ravi M. Gor Hardiksoni, “*Operations Research*”, PHI, P.Ltd., 2010.

ONLINE SOURCES:

3. www.analysiswebnotes.com
4. www.freebookcentre.net

Mapping with Programme Outcomes

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
	CO1	S	M	L	S	M	S	L	S	S	L	S	L	M	S
CO2	M	M	M	S	S	L	M	S	S	S	S	L	M	M	S
CO3	S	L	S	S	S	S	S	S	M	L	S	L	S	M	S
CO4	S	M	S	S	M	S	L	S	M	L	S	L	S	S	S
CO5	S	M	S	S	S	M	S	S	L	M	L	S	M	S	S

S-Strong; M-Medium; L-Low

Programme code	FOR ALL UG	Programme Title		
Course Code	21U4MAN03	Title	Batch	2021-24
		NMEC –II	Semester	IV
Hrs/Week	2	MATHEMATICS	Credits	2
		FOR BANK		
		EXAMINATIONS		

Course Outcomes(CO)

CO Number	CO Statement	Knowledge Level
CO1	To gain the knowledge about Area	K1,K3
CO2	To understand the concept of Volume and surface area	K1,K2
CO3	To apply the concept of Simple interest, Compound interest	K2,K3,K4
CO4	To strengthen the ability to analyze Analogy, Series Completion.	K4
CO5	To determine new techniques of Coding-Decoding, Alphabet Test.	K2,K3,K5

UNIT-I: (6 hours)

Area

UNIT-II:

Volume and surface area **(6 hours)**

UNIT-III: (6 hours)

Simple interest, Compound interest

UNIT-IV: (6 hours)

Analogy, Series Completion

UNIT-V: (6 hours)

Coding-Decoding, Alphabet Test

TOTAL : 30 Hours

Power point Presentations, Seminar ,Quiz, Assignment
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TEXT BOOK:

R.S. Agarwal, “*Quantitative Aptitude*”, S.Chand & Company Ltd., New Delhi, reprint 2011.

R.S. Agarwal, “*A Modern Approach to Verbal and Non verbal Reasoning*”,

S.Chand & Company Ltd., New Delhi, reprint 2011.

REFERENCE BOOKS:

1. R.S. Aggarwal, “*A Modern Approach to Logical Reasoning*”, S.Chand & Company Ltd., New Delhi, 2011.

2. Sandip Jana, “*Mathematics for competitive examinations*”, Academic Publishers, 2011.

3. Kiran Prakasan, “*Quantitative Aptitude for Competitive Examinations*”,

S.Chand and Company private Limited, New delhi, 2008.

ONLINE SOURCES:

1. www.themathpage.com

2. <https://swayam.gov.in>

3. www.brightstorm.com

Mapping with Programme Outcomes

PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	M	M	S	S	S	S	L	M	L	L	S	M	M	M	S
CO2	M	M	S	M	S	M	L	M	L	L	M	L	L	L	S
CO3	S	M	L	M	S	M	M	M	M	L	S	M	M	M	S
CO4	S	M	L	S	S	M	M	M	M	L	S	M	L	L	S
CO5	M	M	S	S	S	S	M	L	L	L	S	M	S	S	S

S-Strong; M-Medium;L-Low

Programme code	FOR ALL UG	Programme Title		
Course Code	21U4MAN04	Title	Batch	2021-24
		NMEC –II NUMERICAL METHODS	Semester	IV
Hrs/Week	2		Credits	2

Course Outcomes(CO)

CO Number	CO Statement	Knowledge Level
CO1	To know about the basic concept of the solution of Numerical Algebraic and transcendental equations	K1,K2
CO2	To understand the concept of Solution of linear simultaneous equations.	K3
CO3	To gain knowledge about Iterative methods.	K1,K2
CO4	To understand the concept of Finite Differences.	K1,K3
CO5	To analyze the concepts of Interpolation with equal intervals.	K2,K4,K5

Unit I : **(6Hrs)**

Solution of Numerical algebraic and transcendental Equations: Bisection method-Iteration method –Method of False Position – Problems.(Chapter 3 : 3.1,3.2,3.3)

Unit II : **(6 Hrs)**

Solution of linear simultaneous equations : Direct methods– Gauss elimination method – Gauss - Jordan method– Problems.(Chapter 4 : 4.1,4.2)

Unit III: **(6 Hrs)**

Solution of linear simultaneous equations : Iterative methods– Gauss Jacobi Method — Gauss - Seidal Method of Iteration - Problems.(Chapter 4 : 4.7,4.8,4.9)

Unit IV: **(6Hrs)**

Finite Differences - Forward differences and backward differences – Symbolic relations and separation of symbols – differences of a polynomial – Problems.(Chapter 5: 5.1,5.2,5.3)

Unit V : **(6 Hrs)**

Interpolation with equal intervals: Newton’s forward and Backward Interpolation formula - Problems. (Chapter 6: 6.1,6.2,6.3)

TEXT BOOK

1. P.Kandasamy, K.Thilgavathy, K.Gunavathi, “*NumericalMethods*”,3rdEdition,2012.

REFERENCEBOOKS

1. E.Balagurusamy,“*Numerical Methods*”,TataMcgrawHillLtd., 1999.
2. RichardL.Burden,J.Douglas Favies,“*NumericalAnalysis*”,NelsonEducation2001.
3. Arunkumarjalan,utpalsarkar,“*NumericalMethods*”,Universitiespress(India)privatelimited,2015.

ONLINESOURCES

1. <https://ocw.mit.edu>.
2. <https://www.mathscard.co.uk>

Mapping with Programme Outcomes

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S	M	S	S	S	S	L	M	L	L	S	M	M	M	S
CO2	M	M	M	S	S	M	L	M	L	L	M	L	L	L	S
CO3	M	M	S	S	M	M	M	M	M	L	S	M	M	M	S
CO4	M	M	S	S	M	M	M	M	M	L	S	M	L	L	S
CO5	S	M	S	S	M	S	M	L	L	L	S	M	S	S	S

S-Strong; M-Medium; L-Low